
Sustainable cities and communities — Indicators for city services and quality of life

*Villes et communautés territoriales durables — Indicateurs pour les
services urbains et la qualité de vie*

STANDARDSISO.COM : Click to view the full PDF of ISO 37120:2018



STANDARDSISO.COM : Click to view the full PDF of ISO 37120:2018



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	xii
Introduction	xiii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 City indicators	4
5 Economy	5
5.1 City's unemployment rate (core indicator)	5
5.1.1 General	5
5.1.2 Core indicator requirements	5
5.2 Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties (supporting indicator)	6
5.2.1 General	6
5.2.2 Supporting indicator requirements	6
5.3 Percentage of persons in full-time employment (supporting indicator)	6
5.3.1 General	6
5.3.2 Supporting indicator requirements	6
5.4 Youth unemployment rate (supporting indicator)	7
5.4.1 General	7
5.4.2 Supporting indicator requirements	7
5.5 Number of businesses per 100 000 population (supporting indicator)	7
5.5.1 General	7
5.5.2 Supporting indicator requirements	8
5.5.3 Data sources	8
5.6 Number of new patents per 100 000 population per year (supporting indicator)	8
5.6.1 General	8
5.6.2 Supporting indicator requirements	8
5.6.3 Data sources	8
5.7 Annual number of visitor stays (overnight) per 100 000 population (supporting indicator)	8
5.7.1 General	8
5.7.2 Supporting indicator requirements	9
5.7.3 Data sources	9
5.8 Commercial air connectivity (number of non-stop commercial air destinations) (supporting indicator)	9
5.8.1 General	9
5.8.2 Supporting indicator requirements	9
5.8.3 Data sources	9
5.9 Economy profile indicators	10
5.9.1 Average household income (USD) (profile indicator)	10
5.9.2 Annual inflation rate based on the average of the past five years (profile indicator)	10
5.9.3 City product per capita (USD) (profile indicator)	10
6 Education	11
6.1 Percentage of female school-aged population enrolled in schools (core indicator)	11
6.1.1 General	11
6.1.2 Core indicator requirements	11
6.1.3 Data sources	12
6.2 Percentage of students completing primary education: survival rate (core indicator)	12
6.2.1 General	12
6.2.2 Core indicator requirements	12
6.2.3 Data sources	13

6.3	Percentage of students completing secondary education: survival rate (core indicator)	13
6.3.1	General	13
6.3.2	Core indicator requirements	13
6.3.3	Data sources	13
6.4	Primary education student–teacher ratio (core indicator)	14
6.4.1	General	14
6.4.2	Core indicator requirements	14
6.4.3	Data sources	14
6.4.4	Data interpretation	14
6.5	Percentage of school-aged population enrolled in schools (supporting indicator)	15
6.5.1	General	15
6.5.2	Supporting indicator requirements	15
6.6	Number of higher education degrees per 100 000 population (supporting indicator)	15
6.6.1	General	15
6.6.2	Supporting indicator requirements	15
6.6.3	Data sources	16
7	Energy	16
7.1	Total end-use energy consumption per capita (GJ/year) (core indicator)	16
7.1.1	General	16
7.1.2	Core indicator requirements	16
7.1.3	Data sources	17
7.2	Percentage of total end-use energy derived from renewable sources (core indicator)	17
7.2.1	General	17
7.2.2	Core indicator requirements	17
7.2.3	Data sources	17
7.2.4	Data interpretation	17
7.3	Percentage of city population with authorized electrical service (residential) (core indicator)	18
7.3.1	General	18
7.3.2	Core indicator requirements	18
7.4	Number of gas distribution service connections per 100 000 population (residential) (core indicator)	18
7.4.1	General	18
7.4.2	Core indicator requirements	18
7.4.3	Data interpretation	19
7.5	Final energy consumption of public buildings per year (GJ/m ²) (core indicator)	19
7.5.1	General	19
7.5.2	Core indicator requirements	19
7.6	Electricity consumption of public street lighting per kilometre of lighted street (kWh/year) (supporting indicator)	19
7.6.1	General	19
7.6.2	Supporting indicator requirements	20
7.7	Average annual hours of electrical service interruptions per household (supporting indicator)	20
7.7.1	General	20
7.7.2	Supporting indicator requirements	20
7.7.3	Data interpretation	20
7.8	Energy profile indicators	20
7.8.1	Heating degree days (profile indicator)	20
7.8.2	Cooling degree days (profile indicator)	21
8	Environment and climate change	22
8.1	Fine particulate matter (PM _{2.5}) concentration (core indicator)	22
8.1.1	General	22
8.1.2	Core indicator requirements	22
8.2	Particulate matter (PM ₁₀) concentration (core indicator)	22
8.2.1	General	22
8.2.2	Core indicator requirements	23

8.3	Greenhouse gas emissions measured in tonnes per capita (core indicator)	23
8.3.1	General	23
8.3.2	Core indicator requirements	23
8.4	Percentage of areas designated for natural protection (supporting indicator)	24
8.4.1	General	24
8.4.2	Supporting indicator requirements	24
8.5	NO ₂ (nitrogen dioxide) concentration (supporting indicator)	25
8.5.1	General	25
8.5.2	Supporting indicator requirements	25
8.5.3	Data sources	25
8.6	SO ₂ (sulfur dioxide) concentration (supporting indicator)	25
8.6.1	General	25
8.6.2	Supporting indicator requirements	26
8.6.3	Data sources	26
8.7	O ₃ (ozone) concentration (supporting indicator)	26
8.7.1	General	26
8.7.2	Supporting indicator requirements	26
8.8	Noise pollution (supporting indicator)	27
8.8.1	General	27
8.8.2	Supporting indicator requirements	27
8.8.3	Data sources	27
8.9	Percentage change in number of native species (supporting indicator)	27
8.9.1	General	27
8.9.2	Supporting indicator requirements	27
8.9.3	Data sources	28
9	Finance	28
9.1	Debt service ratio (debt service expenditure as a percentage of a city's own-source revenue) (core indicator)	28
9.1.1	General	28
9.1.2	Core indicator requirements	28
9.1.3	Data interpretation	28
9.2	Capital spending as a percentage of total expenditures (core indicator)	29
9.2.1	General	29
9.2.2	Core indicator requirements	29
9.2.3	Data sources	29
9.2.4	Data interpretation	29
9.3	Own-source revenue as a percentage of total revenues (supporting indicator)	29
9.3.1	General	29
9.3.2	Supporting indicator requirements	30
9.4	Tax collected as a percentage of tax billed (supporting indicator)	30
9.4.1	General	30
9.4.2	Supporting indicator requirements	30
9.5	Finance profile indicators	30
9.5.1	Gross operating budget per capita (USD) (profile indicator)	30
9.5.2	Gross capital budget per capita (USD) (profile indicator)	31
10	Governance	31
10.1	Women as a percentage of total elected to city-level office (core indicator)	31
10.1.1	General	31
10.1.2	Core indicator requirements	31
10.2	Number of convictions for corruption and/or bribery by city officials per 100 000 population (supporting indicator)	32
10.2.1	General	32
10.2.2	Supporting indicator requirements	32
10.3	Number of registered voters as a percentage of the voting age population (supporting indicator)	32
10.3.1	General	32
10.3.2	Supporting indicator requirement	32

10.4	Voter participation in last municipal election (as a percentage of registered voters) (supporting indicator).....	33
10.4.1	General.....	33
10.4.2	Supporting indicator requirements.....	33
10.4.3	Data sources.....	33
10.4.4	Data interpretation.....	33
11	Health.....	33
11.1	Average life expectancy (core indicator).....	34
11.1.1	General.....	34
11.1.2	Core indicator requirements.....	34
11.2	Number of in-patient hospital beds per 100 000 population (core indicator).....	34
11.2.1	General.....	34
11.2.2	Core indicator requirements.....	34
11.2.3	Data sources.....	35
11.3	Number of physicians per 100 000 population (core indicator).....	35
11.3.1	General.....	35
11.3.2	Core indicator requirements.....	35
11.3.3	Data sources.....	35
11.4	Under age five mortality per 1 000 live births (core indicator).....	35
11.4.1	General.....	35
11.4.2	Core indicator requirements.....	36
11.4.3	Data sources.....	36
11.5	Number of nursing and midwifery personnel per 100 000 population (supporting indicator).....	36
11.5.1	General.....	36
11.5.2	Supporting indicator requirements.....	36
11.6	Suicide rate per 100 000 population (supporting indicator).....	37
11.6.1	General.....	37
11.6.2	Supporting indicator requirements.....	37
11.6.3	Data sources.....	37
12	Housing.....	37
12.1	Percentage of city population living in inadequate housing (core indicator).....	37
12.1.1	General.....	37
12.1.2	Core indicator requirements.....	38
12.1.3	Data sources.....	38
12.2	Percentage of population living in affordable housing (core indicator).....	38
12.2.1	General.....	38
12.2.2	Core indicator requirements.....	38
12.2.3	Data sources.....	38
12.3	Number of homeless per 100 000 population (supporting indicator).....	39
12.3.1	General.....	39
12.3.2	Supporting indicator requirements.....	39
12.4	Percentage of households that exist without registered legal titles (supporting indicator).....	39
12.4.1	General.....	39
12.4.2	Supporting indicator requirements.....	39
12.5	Housing profile indicators.....	40
12.5.1	Total number of households (profile indicator).....	40
12.5.2	Persons per unit (profile indicator).....	40
12.5.3	Vacancy rate (residential) (profile indicator).....	40
12.5.4	Living space (square metres) per person (profile indicator).....	41
12.5.5	Secondary residence rate (profile indicator).....	41
12.5.6	Residential rental dwelling units as a percentage of total dwelling units (profile indicator).....	42
13	Population and social conditions.....	42
13.1	Percentage of city population living below the international poverty line (core indicator).....	42

13.1.1	General	42
13.1.2	Core indicator requirements	42
13.1.3	Data interpretation	43
13.2	Percentage of city population living below the national poverty line (supporting indicator)	43
13.2.1	General	43
13.2.2	Supporting indicator requirements	43
13.2.3	Data interpretation	43
13.3	Gini coefficient of inequality (supporting indicator)	43
13.3.1	General	43
13.3.2	Supporting indicator requirements	44
13.3.3	Data sources	44
13.4	Population and social conditions profile indicators	45
13.4.1	Annual population change (profile indicator)	45
13.4.2	Percentage of population that are foreign born (profile indicator)	45
13.4.3	Population demographics (profile indicator)	45
13.4.4	Percentage of population that are new immigrants (profile indicator)	46
13.4.5	Percentage of city population that are non-citizens (profile indicator)	46
13.4.6	Number of university students per 100 000 population (profile indicator)	47
14	Recreation	47
14.1	Square metres of public indoor recreation space per capita (supporting indicator)	47
14.1.1	General	47
14.1.2	Supporting indicator requirements	47
14.1.3	Data sources	48
14.2	Square metres of public outdoor recreation space per capita (supporting indicator)	48
14.2.1	General	48
14.2.2	Supporting indicator requirements	48
14.2.3	Data sources	49
15	Safety	49
15.1	Number of firefighters per 100 000 population (core indicator)	49
15.1.1	General	49
15.1.2	Core indicator requirements	49
15.2	Number of fire-related deaths per 100 000 population (core indicator)	50
15.2.1	General	50
15.2.2	Core indicator requirements	50
15.2.3	Data sources	50
15.3	Number of natural-hazard-related deaths per 100 000 population (core indicator)	50
15.3.1	General	50
15.3.2	Core indicator requirements	50
15.3.3	Data sources	51
15.3.4	Data interpretation	51
15.4	Number of police officers per 100 000 population (core indicator)	51
15.4.1	General	51
15.4.2	Core indicator requirements	51
15.4.3	Data sources	51
15.5	Number of homicides per 100 000 population (core indicator)	51
15.5.1	General	51
15.5.2	Core indicator requirements	52
15.5.3	Data sources	52
15.6	Number of volunteer and part-time firefighters per 100 000 population (supporting indicator)	52
15.6.1	General	52
15.6.2	Supporting indicator requirements	52
15.7	Response time for emergency response services from initial call (supporting indicator)	52
15.7.1	General	52
15.7.2	Supporting indicator requirements	53
15.8	Crimes against property per 100 000 population (supporting indicator)	53

15.8.1	General	53
15.8.2	Supporting indicator requirements	53
15.9	Number of deaths caused by industrial accidents per 100 000 population (supporting indicator)	53
15.9.1	General	53
15.9.2	Supporting indicator requirements	54
15.10	Number of violent crimes against women per 100 000 population (supporting indicator)	54
15.10.1	General	54
15.10.2	Supporting indicator requirements	54
15.10.3	Data sources	55
16	Solid waste	55
16.1	Percentage of city population with regular solid waste collection (residential) (core indicator)	55
16.1.1	General	55
16.1.2	Core indicator requirements	55
16.1.3	Data sources	55
16.1.4	Data interpretation	55
16.2	Total collected municipal solid waste per capita (core indicator)	56
16.2.1	General	56
16.2.2	Core indicator requirements	56
16.2.3	Data interpretation	57
16.3	Percentage of the city's solid waste that is recycled (core indicator)	57
16.3.1	General	57
16.3.2	Core indicator requirements	57
16.3.3	Data sources	57
16.4	Percentage of the city's solid waste that is disposed of in a sanitary landfill (core indicator)	58
16.4.1	General	58
16.4.2	Core indicator requirements	58
16.4.3	Data sources	58
16.5	Percentage of the city's solid waste that is treated in energy-from-waste plants (core indicator)	58
16.5.1	General	58
16.5.2	Core indicator requirements	59
16.5.3	Data sources	59
16.6	Percentage of the city's solid waste that is biologically treated and used as compost or biogas (supporting indicator)	59
16.6.1	General	59
16.6.2	Supporting indicator requirements	59
16.6.3	Data sources	60
16.7	Percentage of the city's solid waste that is disposed of in an open dump (supporting indicator)	60
16.7.1	General	60
16.7.2	Supporting indicator requirements	60
16.7.3	Data sources	60
16.8	Percentage of the city's solid waste that is disposed of by other means (supporting indicator)	60
16.8.1	General	60
16.8.2	Supporting indicator requirements	61
16.8.3	Data sources	61
16.9	Hazardous waste generation per capita (tonnes) (supporting indicator)	61
16.9.1	General	61
16.9.2	Supporting indicator requirements	61
16.9.3	Data sources	62
16.10	Percentage of the city's hazardous waste that is recycled (supporting indicator)	62
16.10.1	General	62
16.10.2	Supporting indicator requirement	62

	16.10.3 Data sources.....	62
17	Sport and culture.....	63
17.1	Number of cultural institutions and sporting facilities per 100 000 population (core indicator).....	63
17.1.1	General.....	63
17.1.2	Core indicator requirements.....	63
17.2	Percentage of municipal budget allocated to cultural and sporting facilities (supporting indicator).....	63
17.2.1	General.....	63
17.2.2	Supporting indicator requirements.....	64
17.3	Annual number of cultural events per 100 000 population (e.g. exhibitions, festivals, concerts) (supporting indicator).....	64
17.3.1	General.....	64
17.3.2	Supporting indicator requirements.....	64
18	Telecommunication.....	64
18.1	Number of internet connections per 100 000 population (supporting indicator).....	64
18.1.1	General.....	64
18.1.2	Supporting indicator requirements.....	65
18.1.3	Data sources.....	65
18.2	Number of mobile phone connections per 100 000 population (supporting indicator).....	65
18.2.1	General.....	65
18.2.2	Supporting indicator requirements.....	65
18.2.3	Data sources.....	65
19	Transportation.....	66
19.1	Kilometres of public transport system per 100 000 population (core indicator).....	66
19.1.1	General.....	66
19.1.2	Core indicator requirements.....	66
19.1.3	Data sources.....	66
19.2	Annual number of public transport trips per capita (core indicator).....	67
19.2.1	General.....	67
19.2.2	Core indicator requirements.....	67
19.2.3	Data sources.....	67
19.3	Percentage of commuters using a travel mode to work other than a personal vehicle (supporting indicator).....	68
19.3.1	General.....	68
19.3.2	Supporting indicator requirements.....	68
19.3.3	Data sources.....	68
19.4	Kilometres of bicycle paths and lanes per 100 000 population (supporting indicator).....	69
19.4.1	General.....	69
19.4.2	Supporting indicator requirements.....	69
19.5	Transportation deaths per 100 000 population (supporting indicator).....	69
19.5.1	General.....	69
19.5.2	Supporting indicator requirements.....	69
19.6	Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods (supporting indicator).....	70
19.6.1	General.....	70
19.6.2	Supporting indicator requirements.....	70
19.6.3	Data sources.....	70
19.7	Average commute time (supporting indicator).....	71
19.7.1	General.....	71
19.7.2	Supporting indicator requirements.....	71
19.7.3	Data sources.....	71
19.8	Transportation profile indicators.....	71
19.8.1	Number of personal automobiles per capita (profile indicator).....	71
19.8.2	Number of two-wheeled motorized vehicles per capita (profile indicator).....	71
20	Urban/local agriculture and food security.....	72

20.1	Total urban agricultural area per 100 000 population (core indicator)	72
20.1.1	General	72
20.1.2	Core indicator requirements	72
20.2	Amount of food produced locally as a percentage of total food supplied to the city (supporting indicator)	73
20.2.1	General	73
20.2.2	Supporting indicator requirements	73
20.2.3	Data sources	73
20.3	Percentage of city population undernourished (supporting indicator)	73
20.3.1	General	73
20.3.2	Supporting indicator requirements	74
20.3.3	Data sources	74
20.4	Percentage of city population that is overweight or obese — Body Mass Index (BMI) (supporting indicator)	74
20.4.1	General	74
20.4.2	Supporting indicator requirements	74
21	Urban planning	76
21.1	Green area (hectares) per 100 000 population (core indicator)	76
21.1.1	General	76
21.1.2	Core indicator requirements	76
21.1.3	Data sources	76
21.2	Areal size of informal settlements as a percentage of city area (supporting indicator)	76
21.2.1	General	76
21.2.2	Supporting indicator requirements	76
21.2.3	Data sources	77
21.3	Jobs–housing ratio (supporting indicator)	77
21.3.1	General	77
21.3.2	Supporting indicator requirements	77
21.4	Basic service proximity (supporting indicator)	78
21.4.1	General	78
21.4.2	Supporting indicator requirements	78
21.5	Urban planning profile indicators	79
21.5.1	Population density (per square kilometre) (profile indicator)	79
21.5.2	Number of trees per 100 000 population (profile indicator)	79
21.5.3	Built-up density (profile indicator)	79
22	Wastewater	80
22.1	Percentage of city population served by wastewater collection (core indicator)	80
22.1.1	General	80
22.1.2	Core indicator requirements	80
22.1.3	Data sources	80
22.2	Percentage of city's wastewater receiving centralized treatment (core indicator)	80
22.2.1	General	80
22.2.2	Core indicator requirements	81
22.2.3	Data sources	81
22.3	Percentage of population with access to improved sanitation (core indicator)	81
22.3.1	General	81
22.3.2	Core indicator requirements	82
22.4	Compliance rate of wastewater treatment (supporting indicator)	82
22.4.1	General	82
22.4.2	Supporting indicator requirements	82
23	Water	83
23.1	Percentage of city population with potable water supply service (core indicator)	83
23.1.1	General	83
23.1.2	Core indicator requirements	83
23.1.3	Data sources	83
23.2	Percentage of city population with sustainable access to an improved water source (core indicator)	84

23.2.1	General	84
23.2.2	Core indicator requirements	84
23.3	Total domestic water consumption per capita (litres/day) (core indicator)	84
23.3.1	General	84
23.3.2	Core indicator requirements	84
23.3.3	Data sources	85
23.3.4	Data interpretation	85
23.4	Compliance rate of drinking water quality (core indicator)	85
23.4.1	General	85
23.4.2	Core indicator requirements	85
23.5	Total water consumption per capita (litres/day) (supporting indicator)	86
23.5.1	General	86
23.5.2	Supporting indicator requirements	86
23.5.3	Data sources	86
23.6	Average annual hours of water service interruptions per household (supporting indicator)	86
23.6.1	General	86
23.6.2	Supporting indicator requirements	86
23.6.3	Data interpretation	87
23.7	Percentage of water loss (unaccounted for water) (supporting indicator)	87
23.7.1	General	87
23.7.2	Supporting indicator requirements	87
23.7.3	Data sources	87
24	Reporting and record maintenance	87
Annex A (informative)	City indicators	88
Annex B (informative)	Mapping of indicators to ISO 37101 issues and purposes	93
Annex C (informative)	Mapping of indicators to United Nations Sustainable Development Goals (SDGs)	109
Annex D (informative)	Additional profile indicators	116
Bibliography		117

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 268, *Sustainable cities and communities*.

This second edition cancels and replaces the first edition (ISO 37120:2014), which has been technically revised.

In the development of this document, ISO Guide 82 has been taken into account in addressing sustainability issues.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Cities need indicators to measure their performance. Existing indicators at the local level are often not standardized, consistent, or comparable over time or across cities. This document is focused on city services and quality of life as a contribution to the sustainability of the city.

As part of a new series of International Standards being developed for a holistic and integrated approach to sustainable development, that includes indicators for city services and quality of life, indicators for smart cities and indicators for resilient cities, this set of standardized indicators provides a uniform approach to what is measured, and how that measurement is to be undertaken. As a list, it does not provide a value judgement, threshold or target numerical value for the indicators.

Conformance with this document does not confer a status in this regard. A city which conforms to this document in regards to measurement of indicators for city services and quality of life may only claim conformance to that effect.

These indicators can be used to track and monitor progress on city performance. In order to achieve sustainable development, the whole city system needs to be taken into consideration. Planning for future needs should take into consideration current use and efficiency of resources in order to better plan for tomorrow.

The indicators and associated test methods in this document have been developed in order to help cities:

- a) measure performance management of city services and quality of life over time;
- b) learn from one another by allowing comparison across a wide range of performance measures; and,
- c) support policy development and priority setting.

NOTE It is acknowledged that cities might not have direct influence or control over factors governing some of these indicators, but the reporting is important for meaningful comparison and provides a general indication of service delivery and quality of life within a city.

The indicators in this document have been selected to make reporting as simple and inexpensive as possible, and therefore reflect an initial platform for reporting. Further development of indicators to support smartness (ISO 37122¹⁾) and resilience (ISO 37123²⁾) in cities is ongoing in TC 268. This document also includes a third category of indicators – profile indicators – that are recommended to provide basic statistics and background information to help cities conduct peer comparisons. Additional profile indicators are listed in [Annex D](#).

Maintaining, enhancing and accelerating progress towards improved city services and quality of life is also fundamental to the definitions of both smart cities and resilient cities. This document is intended to be implemented in conjunction with ISO 37122 and ISO 37123 to measure progress towards smart cities and resilient cities, respectively. The relationship between the family of standards is presented in [Figure 1](#).

1) Under preparation. Stage at the time of publication: ISO/DIS 37122:2018.

2) Under preparation. Stage at the time of publication: ISO/CD 37123:2018.

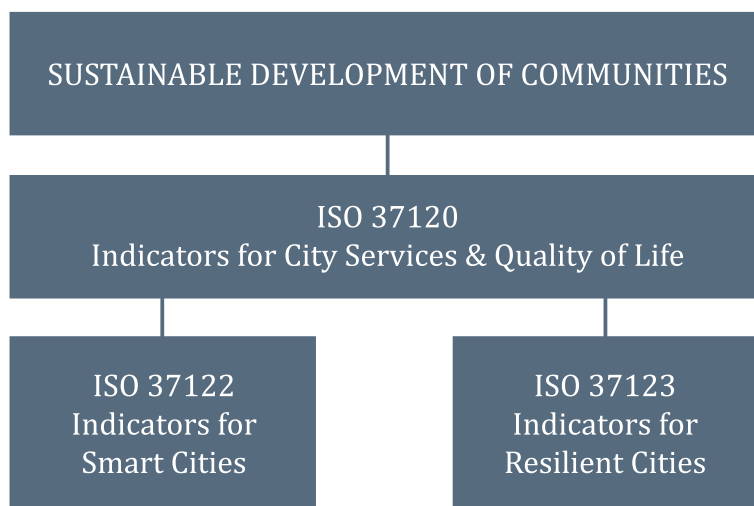


Figure 1 — Sustainable development of communities — Relationship between the family of city indicators standards

The indicators are structured around themes. Recognizing the differences in resources and capabilities of cities worldwide, the overall set of indicators for city performance has been divided into “core” indicators (those implementing this document shall follow) and “supporting” indicators (those implementing this document should follow). Both core and supporting indicators are listed in [Annex A, Table A.1](#).

In this document, the following verbal forms are used:

- “shall” indicates a requirement;
- “should” indicates a recommendation;
- “may” indicates a permission;
- “can” indicates a possibility or a capability.

Sustainable cities and communities — Indicators for city services and quality of life

1 Scope

This document defines and establishes methodologies for a set of indicators to steer and measure the performance of city services and quality of life. It follows the principles set out in ISO 37101 and can be used in conjunction with ISO 37101 and other strategic frameworks.

This document is applicable to any city, municipality or local government that undertakes to measure its performance in a comparable and verifiable manner, irrespective of size and location.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content can be used in conjunction with this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37101, *Sustainable development in communities — Management system for sustainable development — Requirements with guidance for use*

ISO 1996-2, *Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 37101 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

city

municipality

local government

urban community falling under a specific administrative boundary

3.2

city population

number of residents living in a particular city or municipality, typically determined by census every 5 or 10 years

Note 1 to entry: Census populations exclude temporary residents but include residents temporarily absent.

3.3

community

group of people with an arrangement of responsibilities, activities and relationships

Note 1 to entry: In many, but not all, contexts, a community has a defined geographical boundary.

Note 2 to entry: A city is a type of community.

[SOURCE: ISO 37101:2016, 3.4, ISO/TS 37151:2015, 3.1]

3.4 indicator

quantitative, qualitative or descriptive measure

[SOURCE: ISO 15392:2008, 3.14, modified – Note 1 to entry added.]

Note 1 to entry: There are three types of indicators in this document:

- a) core indicators: indicators that are required to demonstrate performance in the delivery of city services and quality of life.
- b) supporting indicators: indicators that are recommended to demonstrate performance in the delivery of city services and quality of life. These indicators can be selected according to city objectives.
- c) profile indicators: indicators that are recommended to provide basic statistics and background information to help cities determine which cities are of interest for peer comparisons. Profile indicators are used as an informative reference.

3.5 full-time enrolment

enrolment in an education programme whose intended study load amounts to at least 75 % of the normal full-time annual study load

[SOURCE: UNESCO, 2011]

3.6 labour force workforce

all employable persons within a specified geographic area

Note 1 to entry: This typically includes all working-age adults between the ages of 15 and 64, but the specific age will vary by country.

3.7 natural hazard

geological or meteorological phenomena that can cause damage to physical infrastructure or loss of life in cities

3.8 part-time enrolment

enrolment in school for at least every half-day in a week over the entire school year or equivalent on a weekly basis

EXAMPLE A student is counted as enrolled part-time if he/she is enrolled in school for every half-day in a week, but is not counted as enrolled if he/she is only enrolled for 0,25 of a day.

3.9 primary education

elementary school

education that is considered to be the first stage of “basic education”

Note 1 to entry: Primary education typically covers six years of full-time schooling with the legal age of entrance normally being not younger than 5 years or older than 7 years. Primary education typically lasts until ages 10–12. Primary education refers to children aged 5–12 years or 1st grade through to 5th or 6th grade, as defined by local education systems.

[SOURCE: UNESCO Institute for Statistics, UOE data collection on education systems, [10.1](#)]

3.10**secondary education**

education that is considered to be the second stage of basic education and marks the end of compulsory education where it exists

Note 1 to entry: Students usually enter between the ages of 10 and 13 (age 12 being the most common). Secondary education usually ends 12 or 13 years after the beginning of primary education (or around age 18). However, this can range from 11 to 14 years after beginning school (or around age 17 to 20). Secondary education also refers to 6th grade (or 7th grade) to 12th grade, as defined by local education systems.

3.11**tertiary education**

education provided by universities and other higher education institutions following secondary education

3.12**hazardous waste**

waste that is potentially harmful to human beings, property or the environment

[SOURCE: ISO 18113-1:2009, 3.22, modified – Examples and Notes removed.]

3.13**solid waste**

non-soluble, discarded solid materials, including sewage sludge, municipal garbage, industrial wastes, agricultural refuse, demolition wastes and mining residues

3.14**vascular plant****tracheophyte**

plant that can internally transport water and food

3.15**per 100 000 population**

in 100 000 of the city's population

Note 1 to entry: The choice of 100 000 population was made to permit cities of different sizes to be able to compare results with each other relatively easily and effectively. It should be noted that in some countries the statistic per 1 000 capita is collected and a slight mathematical adjustment may be necessary to reflect this difference to obtain an accurate comparison. The measure of per 1 000 population might be a more applicable measure for small cities.

3.16**United States dollar****USD**

national currency for the United States of America

Note 1 to entry: It is a benchmark currency and is used in many countries worldwide. To make the conversion from USD to local currency, use the rates posted by the US Federal Reserve Bank: <https://www.newyorkfed.org/markets/foreignex.html>. Make note of the rate and date of conversion.

3.17**public building**

government owned or leased building that functions as a municipal and administrative office, library, recreation centre, hospital, school, fire station or police station

Note 1 to entry: Ownership of buildings (public or private) is variously defined according to region and political system. The restrictive definition used here permits global comparability across cities.

4 City indicators

This document is designed to assist cities in steering and assessing the performance management of city services and all service provisions, as well as quality of life. It considers sustainability as its general principle, and smartness and resilience as guiding concepts in the development of cities. All indicators shall be compiled on an annual basis. If census data are used, the year of census shall be reported. The year of population data shall also be reported.

Those implementing this document shall report on all core indicators listed in [Clauses 5](#) to [23](#) of this document.

The core indicators described in this document are considered essential for steering and assessing the performance management of city services and quality of life.

Depending on the objectives, cities should also report on the supporting indicators given in [Clauses 5](#) to [23](#) of this document.

The core, supporting and profile indicators are classified into themes according to the different sectors and services provided by a city. The classification structure is used solely to denote the services and area of application of each type of indicator when reported on by a city. This classification of themes has no hierarchical significance and is organized alphabetically. For each indicator, the correspondence with the issues of ISO 37101 is noted [for consistency with [Annex B, Table B.1](#), and with the United Nations Sustainable Development Goals (SDGs) ([Annex C](#))].

For data interpretation purposes, cities shall take into consideration contextual analysis when interpreting results. The local institutional environment may affect the capacity to apply indicators. In some cases, services may be delivered by the private sector or the community itself.

Indicators under each theme, where possible, were selected and paired on the basis of input and outcome indicators for further contextual analysis.

When interpreting the results of a particular service area, it is important to review the results of multiple types of indicators across themes; to focus on a single indicator can lead to a distorted or incomplete conclusion. Elements of aspiration shall also be taken into consideration in the analysis.

Users may also consider the following aspects which shall be clearly stated in the report and justified:

- indicators can be aggregated to larger administrative areas (e.g. region, metropolitan area);
- since some indicators are indirectly linked to sustainability, there is a need to consider the resource efficiency of a city;
- indicators can be grouped together for analysis when taking into consideration holistic characteristics of a city; and
- this set of indicators may be complemented by other indicator sets in order to have a more comprehensive, holistic approach to analysis on sustainability.

Furthermore, it is also important to acknowledge potential antagonistic effects of the outcome of particular indicators, either positive or negative, when analysing results. For example, the number of automobiles per capita will potentially result in increased levels of greenhouse gas emissions.

5 Economy

5.1 City's unemployment rate (core indicator)

5.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The unemployment rate is considered one of the most informative labour market indicators reflecting the general performance of the labour market and the health of the economy as a whole. It is used to measure a city's unutilized labour supply and track business cycles. When economic growth is strong, unemployment rates tend to be low and when the economy is stagnating or in recession, unemployment rates tend to be higher.

NOTE 2 This indicator reflects "Living together, interdependence and mutuality" and "Economy and sustainable production and consumption" issues as defined in ISO 37101. It can allow an evaluation of the contribution to "Social cohesion", "Well-being", "Attractiveness" and "Resilience" purposes of the city as defined in ISO 37101.

5.1.2 Core indicator requirements

A city's unemployment rate shall be calculated as the number of working-age primary residents who during the survey reference period were not in paid employment or self-employment, but available for work and seeking work (numerator) divided by the total labour force (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Unemployment shall refer to individuals without work, actively seeking work in a recent period (past four weeks) and currently available for work. Persons who did not look for work but have a future labour market stake (arrangements for a future job start) are counted as unemployed (International Labour Organization). Discouraged workers or hidden unemployed shall refer to persons who are not actively seeking work because they believe the prospects of finding it are extremely poor or they have restricted labour mobility, face discrimination and/or structural, social and cultural barriers. They are not counted as part of the labour force, and are therefore not considered to be unemployed. Not actively seeking work shall refer to people who have not taken active steps to seek work (e.g. job searches, interviews, informational meetings) during a specified recent period (usually the past four weeks).

Labour force shall refer to the sum of the total persons employed and unemployed who are legally eligible to work and who are primary residents of the city.

For cities that cannot report unemployment at the city level, the reporting level should be indicated.

NOTE 1 If data are categorized by gender, cities are encouraged to specify the respective unemployment rates for males and females during reporting of the overall unemployment rate

NOTE 2 The social responsibility core subjects of human rights and labour practices from ISO 26000 can be considered, and are particularly useful in regards to child labour.

NOTE 3 The International Labour Organization (ILO) Fundamental Principles and Rights at Work (FPRW) include the elimination of child labour alongside the right to freedom of association and collective bargaining, elimination of forced labour, and the elimination of discrimination in employment or occupation. These fundamental principles and rights at work are mutually interdependent. Violation of one category of rights at work often has an adverse impact on the respect and realization of the others. Vice versa, recognition, promotion and implementation of one category of rights can have a beneficial impact on the respect and realization of the others.

Over the years the international community has developed a framework of International Standards which seek to protect children from child labour, in particular the two important ILO Conventions on the subject and more generally the UN Convention on the Rights of the Child^[45]. Although some progress is being made in reducing child labour, in too many cases the rights contained in these International Standards are still not fully applied in practice and enforced. Users of this document are encouraged to keep these principles in mind.

5.2 Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties (supporting indicator)

5.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties provides an understanding of the mix of assessed values of properties as well as the stability of the assessed base. A downward trend in the proportion of commercial and industrial assessed values could indicate an eroding economic base. Overreliance on residential assessed values can impact affordability.

NOTE 2 This indicator reflects “economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to “attractiveness” and “resilience” purposes of the city as defined in ISO 37101.

5.2.2 Supporting indicator requirements

The assessed value of commercial and industrial properties as a percentage of total assessed value of all properties shall be expressed as the total assessed value of commercial and industrial properties (numerator) divided by the total assessed value of all properties (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Commercial and industrial properties shall refer to those which have been designated by the city for commercial and industrial use.

NOTE Property assessment methods might vary from one jurisdiction or country to another, including the market-oriented method, the profit-oriented method and the cost-oriented method.

5.3 Percentage of persons in full-time employment (supporting indicator)

5.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The persons living in the city in full-time employment is an indicator of the economic health of the city and the success of city economic policy.

For cities that cannot report employment at the city level, the reporting level should be indicated.

NOTE 2 This indicator reflects “living together, interdependence and mutuality” and “economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to “social cohesion”, “well-being”, “attractiveness” and “resilience” purposes of the city as defined in ISO 37101.

5.3.2 Supporting indicator requirements

The percentage of persons in full-time employment shall be calculated as the number of persons in full-time employment (numerator) divided by the total labour force (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of persons residing in the city in full-time employment shall include residents who are self-employed and shall only include those who work a minimum of 35 h a week in one job and who are of legal working age (International Labour Organization).

NOTE Employment is a formal labour market concept which is often complicated in developing countries with a large informal sector of the city economy.

5.4 Youth unemployment rate (supporting indicator)

5.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The unemployment rate is probably the best-known and most used labour market performance indicator. Youth unemployment rate is a key indicator for quantifying and analysing the current labour market trends and challenges of young people, being considered as more sensitive to market changes. Youth unemployment can have damaging effects on individuals, communities, economies and society at large. Unemployed or underemployed youths are less able to contribute effectively to community and national development and have fewer opportunities to exercise their rights as citizens.

NOTE 2 This indicator reflects “living together, interdependence and mutuality”, “education and capacity building” and “economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to “social cohesion”, “well-being”, “attractiveness” and “resilience” purposes of the city as defined in ISO 37101.

5.4.2 Supporting indicator requirements

The youth unemployment rate shall be calculated as the total number of a city’s unemployed youth (numerator) divided by the city’s youth labour force (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Unemployed youth shall refer to individuals above the legal working age and under 24 years of age who are without work, actively seeking work in a recent period (past four weeks) and currently available for work (registered students are not counted). Youths who did not look for work but have a future labour market stake (arrangements for a future job start) are counted as unemployed (International Labour Organization, <http://youthstatistics.org/>). Discouraged workers or hidden unemployed shall not be counted as part of the labour force, and are therefore not considered to be unemployed. Not actively seeking work shall refer to people who have not taken active steps to seek work (e.g. job searches, interviews, informational meetings) during a specified recent period (usually the past four weeks).

Youth labour force shall refer to all persons above the legal working age and under 24 years of age who are either employed or unemployed over a specified reference period.

NOTE Countries vary somewhat in their operational definitions of youth; in particular, the lower age limit for young people is usually determined by the minimum age for leaving school, where this exists.

For cities that cannot report unemployment rates at municipal level, the reporting level should be indicated.

5.5 Number of businesses per 100 000 population (supporting indicator)

5.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The number of businesses per 100 000 can inform a city’s level of economic activity and economic performance. It provides one indication of the overall business climate in a jurisdiction, and attitudes towards entrepreneurship. Strong entrepreneurial activity is closely associated with a dynamic and growing economy. The number of businesses is also used to inform competitiveness of a city.

NOTE 2 This indicator reflects the “economy and sustainable production and consumption” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “attractiveness” purpose of the city as defined in ISO 37101.

5.5.2 Supporting indicator requirements

The number of businesses per 100 000 population shall be calculated as the total number of businesses in a city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of businesses per 100 000 population.

Businesses shall refer to companies or enterprises. The enterprise is the smallest combination of legal unit, that is, an organizational unit producing goods or services. Business can either be categorized as simple (one operating entity) or complex (multiple operating entities).

5.5.3 Data sources

Cities should consult a business registry to obtain data on the number of businesses.

5.6 Number of new patents per 100 000 population per year (supporting indicator)

5.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The number of patents issued to persons or corporations of a city is an indicator of commercial and technological innovation.

NOTE 2 This indicator reflects the "innovation, creativity and research" and "economy and sustainable production and consumption" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "attractiveness" purpose of the city as defined in ISO 37101.

5.6.2 Supporting indicator requirements

The number of new patents per 100 000 population per year shall be calculated as the total number of new patents issued to persons and corporations of the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of patents registered per 100 000 population.

5.6.3 Data sources

As patents are generally issued by the national government, cities will be reliant on another level of government to provide this information on an annual city-by-city basis.

Data should be obtained from Government patent offices, which maintain records of all patents registered to persons and corporations across their jurisdiction.

5.7 Annual number of visitor stays (overnight) per 100 000 population (supporting indicator)

5.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 This indicator measures the number of people visiting a city for leisure, business or other purposes, and the importance of tourism to the local economy.

NOTE 2 This indicator reflects the "economy and sustainable production and consumption" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "attractiveness" purpose of the city as defined in ISO 37101.

5.7.2 Supporting indicator requirements

The annual number of visitor stays (overnight) per 100 000 population shall be calculated as the sum of overnight visitor stays (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the annual number of visitor stays (overnight) per 100 000 population.

Visitor stays shall refer to paid, per person nightly accommodation at hotels, hostels, vacation centres, rented houses/cottages and campsites. Overnight stays with family or friends, or in private houses or cottages, are not included.

NOTE Two people staying in one hotel room for one night is counted as two overnight stays.

5.7.3 Data sources

Data should be gathered from the best available data sources pertaining to visitor arrivals and paid accommodation in a city. These can include statistics taken from tourism boards and from hotel and lodging associations.

5.8 Commercial air connectivity (number of non-stop commercial air destinations) (supporting indicator)

5.8.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The diversity of non-stop commercial airline destinations is indicative of a city's connectivity to the rest of the nation and the world. Cities with high commercial air connectivity typically have more robust economies and are able to provide a higher level of service to residents. Although commercial air is one demonstration of connectivity, other modes such as rail can also measure connectivity and could be considered a more sustainable alternative to air travel.

NOTE 2 This indicator reflects the "mobility," "community infrastructures" and "economy and sustainable production and consumption" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "attractiveness" purpose of the city as defined in ISO 37101.

5.8.2 Supporting indicator requirements

Commercial air connectivity shall be calculated as the sum of all non-stop commercial (i.e. scheduled) flights departing from all airports serving the city.

Airports serving the city shall include all airports within a 2-h travel distance from the subject city (e.g. Paris could count flights departing from Charles de Gaulle and Orly airports). Connecting flights shall be excluded because travel is theoretically possible between any two cities in the world, given an unlimited number of connections.

5.8.3 Data sources

Commercial air destination lists should be obtained from airport operators, passenger airport facility planners, and/or federal aviation agencies. Web resources including airline websites and the Official Airline Guide (OAG) may also be used.

5.9 Economy profile indicators

5.9.1 Average household income (USD) (profile indicator)

5.9.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Household income measures the combined incomes of the people in a particular household. An average of household income in a city can indicate the monetary well-being of residents within the city.

5.9.1.2 Profile indicator requirements

The average household income shall be calculated as the sum of total income received during the calendar year by all households within city boundaries (numerator) divided by the total number of households within city boundaries (denominator). The result shall be expressed as the average household income in USD.

Household income shall include income earned by all household members who are 15 years of age or older.

To make the conversion from local currency, cities should use the rates posted by the US Federal Reserve Bank: <https://www.newyorkfed.org/markets/foreignex.html>. Cities should also make note of the rate and date of conversion.

5.9.2 Annual inflation rate based on the average of the past five years (profile indicator)

5.9.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Inflation is the general increase in price of goods and services in an economy. An increase in prices might result in reduced purchasing power per unit of money. The Consumer Price Index (CPI) is one of the simplest and most frequently used statistics to calculate inflation rates. The formula to calculate inflation rate for a 1-year period is $[(B - A) / A] \times 100$, where B is the current CPI value and A is the CPI value from 1 year ago.

5.9.2.2 Profile indicator requirements

The annual inflation rate based on the average of the past five years shall be calculated as the sum of the rate of inflation of the preceding five years (numerator) divided by five (denominator). The result shall be expressed as a percentage.

For cities that cannot report annual inflation rate at the city or municipal level, the reporting level should be indicated.

5.9.3 City product per capita (USD) (profile indicator)

5.9.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE City product per capita is the same concept as gross national product but applied to a city or municipality only. It provides indication of city economic development, employment and investment. Moreover, it provides better indication of international trade than other more traditional measures such as gross domestic product.

5.9.3.2 Profile indicator requirements

The annual city product shall be calculated using one of two methods:

Method A consists of taking the national product in each industry sector (SITC standard industry classification) and then multiplying it by the differential wage rates at the city level, for each industry sector. This method is used when employment by industry sector is known.

Method B consists of using the city household income figures and by multiplying the ratio of gross national product (GNP) to total household income at the national level. This method assumes that the ratio of the GNP to the household income is the same at the city and national level. So far, this method has been used in most of the UN habitat city indicator reports.

Method A is considered preferable. However, the method used in calculating the city product should be clearly noted in the result reported.

The city product should then be converted into US dollars and divided by the current population of the city to give a per capita figure, expressed in US dollars. To make the conversion from local currency, cities should use the rates posted by the US Federal Reserve Bank: <https://www.newyorkfed.org/markets/foreignex.html>. Cities should also make note of the rate and date of conversion.

City product is difficult to calculate. If cities do not have ready estimates of city product based on own methodologies or established industry norms, then Method A or B should be used. Note that these methods provide estimates of city product, not exact values.

5.9.3.3 Data sources

Data for this indicator are available from the agency of each national government charged with the responsibility of collecting gross national product data. Data can also be available from the offices of city managers or finance offices of the city if a city is already calculating city product within the city government.

6 Education

6.1 Percentage of female school-aged population enrolled in schools (core indicator)

6.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Education is one of the most important aspects of human development. This indicator addresses the issue of educational opportunity, by indicating how widespread formal education is in the city among school-aged population. Reporting on the differential enrolment by gender is consistent with the Sustainable Development Goals, Goal 5: Achieve Gender Equality and Empower all Women and Girls^[22].

NOTE 2 This indicator reflects the “Education and capacity building” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion”, “Resilience” and “Well-being” purposes of the city as defined in ISO 37101.

6.1.2 Core indicator requirements

The percentage of female school-aged population enrolled in schools shall be calculated as the number of a city’s female school-aged population enrolled at primary and secondary levels in public and private schools (numerator) divided by the total number of a city’s female school-aged population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The proportion of enrolment in public and private schools should be reported, and cities should note if private school data are included. In many cities, private schools are a significant component of

education in the city. Private schools shall be recognized as providing real, bona fide education; many ministries or departments of education have a program that recognizes such schools. Enrolment in religious schools and home schools should be included if they are recognized.

One part-time enrolment of a half-day or more shall be counted as a full-time enrolment.

If the geographies of school districts and the city are different, best judgement should be used to relate enrolment data to the city boundaries.

NOTE Primary education is considered to be the first stage of basic education. It typically covers six years of full-time schooling with the legal age of entrance normally being not younger than 5 years or older than 7 years. Primary education refers to children aged 5–12 years or 1st grade through to 5th or 6th grade, as defined by local education systems. Secondary education is considered to be the second stage of basic education and marks the end of compulsory education where it exists. Secondary students usually enter between the ages of 10 and 13. Secondary education usually ends approximately 12 or 13 years after the beginning of primary education (or around age 18). Secondary education also refers to 6th grade (or 7th grade) to 12th grade, as defined by local education systems.

6.1.3 Data sources

Data on school enrolment should be obtained from local school boards, or the relevant Ministry or Department of Education. If enrolment data from these sources are not available, then data for enrolment from surveys or censuses may be used.

6.2 Percentage of students completing primary education: survival rate (core indicator)

6.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Survival rate measures the holding power and internal efficiency of an education system. Survival rate to the fifth grade of primary education is of particular interest since this is commonly considered as a prerequisite for sustainable literacy. This indicator is often used as an assessment of Sustainable Development Goals, Goal 4: Quality Education[22].

NOTE 2 This indicator reflects the “Education and capacity building” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion”, “Resilience” and “Well-being” purposes of the city as defined in ISO 37101.

6.2.2 Core indicator requirements

The percentage of students completing primary education (survival rate) shall be calculated as the total number of a city’s students belonging to a school-cohort who complete the final grade of primary education (numerator) divided by the total number of a city’s students belonging to a school cohort, i.e. those originally enrolled in the first grade of primary education (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The survival rate of primary education shall refer to the percentage of a cohort of students enrolled in the first grade of primary education who reached the final grade of primary education. If data are categorized by public and private education sectors, cities are encouraged to specify the respective survival rates for those sectors during reporting of the overall survival rate.

NOTE 1 This indicator measures students belonging to a school cohort who have reached each successive grade of primary education without failing or moving to another jurisdiction.

NOTE 2 This methodology is adapted from UNESCO Education Indicator Technical Guidelines[4].

EXAMPLE If the city reporting year is 2012 and primary education lasts five years, the percentage of students who entered primary education in 2006 and reached the final grade of primary education in 2011 would be reported.

NOTE 3 Since the calculation of this indicator is based on student-flow rates, the reliability of the survival rate depends on the consistency of data on enrolment and repeaters (those who repeat one or more grades) in terms of coverage over time.

6.2.3 Data sources

Data on school enrolment is usually recorded by the Ministry or Department of Education or local school boards. In some cities survival rates will only be readily available for public school systems. However, since private schools are a significant component of education in many cities, private schools shall be recognized as providing real, bona fide education and since many ministries or departments of education have a program that recognizes such schools, both private and public school data should be included in this calculation.

6.3 Percentage of students completing secondary education: survival rate (core indicator)

6.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Survival rate measures the holding power and internal efficiency of an education system.

NOTE 2 This indicator reflects the “Education and capacity building” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion”, “Resilience” and “Well-being” purposes of the city as defined in ISO 37101.

6.3.2 Core indicator requirements

The percentage of students completing secondary education (survival rate) shall be calculated as the total number of a city’s students belonging to a school cohort who complete the final grade of secondary education (numerator) divided by the total number of a city’s students belonging to a school cohort, i.e. those originally enrolled in the first grade of secondary education (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Survival rates for the private education sector should be reported, if known. The user of this document shall note if private school data are included.

NOTE 1 This indicator measures students belonging to a school cohort who have reached each successive grade of secondary education without failing or moving to another jurisdiction.

NOTE 2 This methodology is adapted from UNESCO Education Indicator Technical Guidelines^[4].

EXAMPLE If the city reporting year is 2012 and secondary education lasts seven years, the percentage of students who entered secondary education in 2004 and reached the final grade of secondary education in 2011 would be reported.

6.3.3 Data sources

Since the calculation of this indicator is based on student-flow rates, the reliability of the survival rate depends on the consistency of data on enrolment and repeaters (those who repeat one or more grades) in terms of coverage over time and across grades.

In most cities, survival rates will only be readily available for public school systems. However, since private schools are a significant component of education in many cities, private schools shall be recognized as providing real, bona fide education and since many ministries or departments of

education have a program that recognizes such schools, both private and public school data should be included in this calculation.

NOTE Data on school enrolment are usually recorded by the Ministry or Department of Education or by local school boards.

6.4 Primary education student-teacher ratio (core indicator)

6.4.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The student-teacher ratio is an indicator of the adequacy of teacher availability and can be related to the strength and quality of an education system.

NOTE 2 This indicator reflects the "Education and capacity building" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Responsible resource use" purpose of the city as defined in ISO 37101.

6.4.2 Core indicator requirements

The primary education student-teacher ratio shall be expressed as the number of enrolled primary school students (numerator) divided by the number of full-time equivalent (FTE) primary school classroom teachers (denominator). The result shall be expressed as the number of students per teacher and represent the primary education student-teacher ratio.

Private educational facilities shall not be included in the student-teacher ratio. The number of teachers and students shall be reported as the average per school year.

One part-time student enrolment shall be counted as one full-time enrolment; in other words a student who attends school for half a day should be counted as a full-time enrolment. If a city reports FTE enrolment (where two half-day students equals one full student enrolment), this shall be noted.

The number of classroom teachers and other instructional staff (e.g. teachers' aides, guidance counsellors) shall not include administrators or other non-teaching staff. Kindergarten or pre-school teachers and staff shall not be included.

The number of teachers shall be counted in time increments according to local school practices and number of days worked. For example, a teacher working one day per week should be counted as 0.2 teachers, and a teacher working three days per week should be counted as 0.6 teachers, if the number of days worked is usually 5 days.

6.4.3 Data sources

The number of FTE primary school classroom teachers and the number of enrolled primary school students should be collected from the local public school system or Ministry of Education.

6.4.4 Data interpretation

The student-teacher ratio reflects teacher workload and the availability of teachers' services to their students. The lower the student-teacher ratio, the higher the availability of teacher services to students. The student-teacher ratio has implications not only for the cost of education, but also for the quality. Higher educational attainment is correlated with a lower student-teacher ratio.

6.5 Percentage of school-aged population enrolled in schools (supporting indicator)

6.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Education is one of the most important aspects of human development. This indicator addresses the issue of educational opportunity by indicating how widespread formal education is in the city among the school-age population.

NOTE 2 This indicator reflects the “Education and capacity building” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion”, “Resilience” and “Well-being” purposes of the city as defined in ISO 37101.

6.5.2 Supporting indicator requirements

The percentage of school-aged population enrolled in schools shall be calculated as the number of a city’s school-aged population enrolled in primary and secondary levels in public and private schools (numerator) divided by the total number of the city’s school-aged population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Enrolment in public and private schools should be reported, and cities should note in the comment section if private school data are included. In many cities, private schools are a significant component of education in the city. Private schools shall be recognized as providing real, bona fide education; many ministries or departments of education have a program that recognizes such schools. Enrolment in religious schools and home schools should be included if they are recognized.

Part-time enrolment of a half-day or more shall be counted as a full-time enrolment.

If the geographies of school districts and the city are different, best judgement should be used to relate enrolment data to the city boundaries.

6.6 Number of higher education degrees per 100 000 population (supporting indicator)

6.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Education is a major component of well-being and is an indicator of economic development and quality of life. A city’s population that holds higher education degrees signals a well-educated workforce across a city’s population that helps to drive economic development. Higher education degrees provide individuals with a foundation for meaningful participation in the labour force.

NOTE 2 This indicator reflects the “Education and capacity building” issue as defined in ISO 37101. It can allow an evaluation of the contribution to “Social Cohesion”, “Resilience”, “Attractiveness” and “Well-being” purposes of the city as defined in ISO 37101.

6.6.2 Supporting indicator requirements

The number of higher education degrees per 100 000 population shall be calculated as the number of people holding higher education (tertiary education) degrees (numerator) divided by one 100 000th of the city’s total population. The result shall be expressed as the number of higher degrees per 100 000 population.

Higher education shall refer to forms of tertiary learning beyond those of secondary level. Higher education is offered through universities, colleges, institutes, academies, seminaries and trade schools that grant academic degrees and/or professional certifications.

6.6.3 Data sources

Data on the number of people holding higher education degrees should be available from census and household surveys.

7 Energy

7.1 Total end-use energy consumption per capita (GJ/year) (core indicator)

7.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 An understanding of how much energy is currently being consumed can help cities to effectively manage the generation, consumption and conservation of energy. This process can be aided further with an understanding of what types of energy are used by end-use sector.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” purpose of the city as defined in ISO 37101.

7.1.2 Core indicator requirements

Total end-use energy consumption per capita shall be calculated as the total end-use energy consumed³⁾ by a city in gigajoules (numerator) divided by the total population of the city (denominator). The result shall be expressed as the total end-use energy consumed per capita in gigajoules per year.

Heating and cooling degree days as reported in 7.8.1 and 7.8.2 should be considered in order to allow for comparison between years and across regions.

Table 1 — Total end-use energy consumption by type and by sector

	Electricity	Coal	Fuel oil	Natural gas/ propane/ butane/ LPG	Gasoline	Diesel	Biomass	Biofuels	Other	Total
Residential										
Commercial										
Industrial										
Transportation										
Other sector										
TOTAL										

“Other sector” includes sectors such as agriculture that are not explicitly stated. As a minimum, all sectors shall be reported with total needs.

NOTE Commercial can also be referred to as tertiary/service sector ranging from commerce to administration (public buildings), financial and real estate activities, services to business, personal services, education, health and social services.

3) The inputs used to provide the sum of total end-use energy usage should include a breakdown of the fuel type by end-use sector. Categories of fuel types include electricity, coal, fuel oil, natural gas, gasoline, diesel, biomass, biofuels and other. Once the energy mix is provided, the usage of energy consumption should be further divided by end-use sector. End-use sectors include residential, commercial, industrial, transportation and other. Total energy consumption should include thermal, motive and electrical energy for all sectors.

Where possible, the energy mix and data from each sector for thermal (e.g. heating of buildings) and electrical energy use should be included and listed as additional information. See [Table 1](#).

7.1.3 Data sources

Data should be gathered from electricity and fuel distributors. Electricity consumption statistics are typically collected in categories of residential, industrial, transportation, commercial and other sector.

7.2 Percentage of total end-use energy derived from renewable sources (core indicator)

7.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The promotion of renewable energy sources is a high priority for sustainable development, for reasons such as the security and diversification of energy supply and for environmental protection.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” and “Resilience” purposes of the city as defined in ISO 37101.

7.2.2 Core indicator requirements

The percentage of total end-use energy derived from renewable sources shall be calculated as the total consumption of end-use energy generated from renewable sources divided by total end-use energy consumption. The result shall then be multiplied by 100 and expressed as a percentage.

Renewable energy sources should include geothermal, solar, wind, hydro, tide and wave energy, combustibles and biofuels such as biomass.

Total renewable energy consumption shall include both thermal energy and electrical energy from all sectors including residential, transport, service/trade and industrial. Where possible, data from each sector for both thermal and electrical energy use shall be included and listed individually.

	Thermal energy	Electrical energy
Total renewable energy consumption		

7.2.3 Data sources

Data are available from local utility providers, city energy or environment offices, and from various international sources such as the International Energy Agency (IEA) and the World Bank.

7.2.4 Data interpretation

End-use energy from renewable sources shall include both combustible and non-combustible renewables. Non-combustible renewable electricity sources include geothermal, solar, wind, hydro, tide and wave energy. For geothermal energy, the energy quantity is the enthalpy of the geothermal heat entering the process. The combustible renewables and waste (CRW) consist of biomass (e.g. fuelwood, vegetal waste, ethanol) and animal products (animal materials/waste with sulphite lyes), municipal waste (waste produced by the residential, commercial and public service sectors that is collected by local authorities for disposal in a central location for the production of heat and/or power) and biogenic industrial waste.

The breakdown of end-use energy consumption by source, if these data are available (e.g. % derived from fossil fuel; % derived from nuclear; % derived from renewables), should be noted.

NOTE Data on particular renewable electricity sources for a number of developing countries might be a limitation.

7.3 Percentage of city population with authorized electrical service (residential) (core indicator)

7.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the city population with authorized connection to the electricity supply system (the electricity grid) is an indicator of lawful provision of a basic urban service, which is of particular relevance to cities in less developed regions of the world. Electrical service is a contributing indicator of sustainability, resilience and economic productivity.

NOTE 2 This indicator reflects the “Community infrastructures” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Resilience”, “Attractiveness” and “Well-being” purposes of the city as defined in ISO 37101.

7.3.2 Core indicator requirements

The percentage of the city population with authorized electrical service (residential) shall be calculated as the number of people in the city with authorized electrical service (numerator) divided by the total population of the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Authorized electrical service shall refer to a lawful connection to the electrical supply system.

The number of city households with authorized connections to the electricity supply system (often referred to as the electricity grid) shall be multiplied by the current average city household size to determine the number of people with authorized connection to the electricity supply system.

NOTE Most electricity supply authorities distinguish billing accounts to residential and non-residential establishments. Residential establishments in most cities equate to households (although in some condominiums, the body corporate holds the account for multiple households).

7.4 Number of gas distribution service connections per 100 000 population (residential) (core indicator)

7.4.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The number of gas distribution service connections is an indicator of a basic service provision in cities of cool climates or where there is a prevalence of gas appliance use.

NOTE 2 This indicator reflects the “Community infrastructures” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Attractiveness” and “Well-being” purposes of the city as defined in ISO 37101.

7.4.2 Core indicator requirements

The number of gas distribution service connections per 100 000 population (residential) shall be calculated as the number of people in the city with connection to gas distribution services (numerator)

divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of gas distribution service connections per 100 000 population.

The number of city households with connections to the gas distribution supply system shall be multiplied by the current average city household size to determine the number of people with connection to the gas supply system.

7.4.3 Data interpretation

Not all cities use gas distribution networks, and thus a reported low value of this indicator does not suggest inadequate service delivery.

7.5 Final energy consumption of public buildings per year (GJ/m²) (core indicator)

7.5.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Buildings are the largest energy consumers in most cities. Reduced and efficient energy consumption can create substantial savings and can enhance security of the energy supply. Reducing the energy consumption of a building can also reduce greenhouse gas emissions and its ecological footprint, which can help combat climate change and promote a low-carbon economy.

NOTE 2 This indicator reflects the "Economy and sustainable production and consumption" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Responsible resource use" purpose of the city as defined in ISO 37101.

7.5.2 Core indicator requirements

Final energy consumption of public buildings per year shall be calculated as the total end use of energy in public buildings (GJ) within a city (numerator) divided by total floor space of these buildings in square metres (m²) (denominator). The result shall be expressed as the total final energy consumption of public buildings per year in gigajoules per square metre.

Energy consumption shall include both thermal and electrical energy consumption.

NOTE See [3.17](#).

7.6 Electricity consumption of public street lighting per kilometre of lighted street (kWh/year) (supporting indicator)

7.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Street lighting can comprise 15 % to 50 % of public electricity. Improving the efficiency of street lighting is also one of the most important and cost-effective steps that a city can take to improve energy efficiency. Improving the quality and efficiency of public street lighting has multiple co-benefits, including reduced maintenance costs, improved public safety and reduced crime rates, improved road and traffic safety, improved air quality, enhanced city attractiveness and community identity and increased economic productivity.

NOTE 2 This indicator reflects the "Economy and sustainable production and consumption" and "Community infrastructure" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Responsible resource use" purpose of the city as defined in ISO 37101.

7.6.2 Supporting indicator requirements

Electricity consumption of public street lighting shall be calculated as the total electricity consumption of public street lighting (numerator) divided by the total distance of streets where street lights are present (denominator). The result shall be expressed as electricity consumption of public street lighting in kilowatt hours per kilometre per year.

For the purposes of the standard, the street lighting should meet locally or nationally defined standards for illumination and/or the requirements set by the International Commission on Illumination, Technical Report CIE 115:2010, "Lighting of Roads for Motor and Pedestrian Traffic."

7.7 Average annual hours of electrical service interruptions per household (supporting indicator)

7.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Average annual hours of electrical service interruptions helps to track and benchmark reliability performance in electric utility services and resource constraints.

NOTE 2 This indicator reflects the "Community infrastructure" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being", "Attractiveness" and "Resilience" purposes of the city as defined in ISO 37101.

7.7.2 Supporting indicator requirements

The average annual hours of electrical service interruptions per household shall be calculated by taking the total sum of hours of interruption multiplied by the number of households impacted (numerator) divided by the total number of households (denominator). The result shall be expressed as the average annual hours of electrical service interruptions per household.

It is normal to experience interruptions in service for a number of reasons including scheduled maintenance, equipment breakdown and power load shedding. To ensure valid comparisons between energy providers, major storms and weather events should be excluded due to their variability with geographic location.

NOTE This indicator is affected by the age, standard of maintenance and reliability of the infrastructure that constitutes electricity distribution and transmission. The ability of both the grid and its electricity transmission capacity to provide supply on demand and to cope with peak loads is also an important consideration.

7.7.3 Data interpretation

Cities with older infrastructure, intermittent power supply, war or civil unrest, or exposure to natural hazards will tend to experience more service interruptions.

7.8 Energy profile indicators

7.8.1 Heating degree days (profile indicator)

7.8.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Degree days indicate the energy demands of buildings as a response to their local and regional climate. 'Heating' degree days is a measure of the space heating requirements of buildings, while "cooling" degree days is a measure of the space cooling requirements.

7.8.1.2 Profile indicator requirements

Heating degree days shall be calculated by subtracting the mean daily air temperature from the standard baseline air temperature, and then summed for each day of the year to meet an annual total. If the temperature difference is a negative number, it shall be omitted from the calculation. The result shall be expressed as heating degree days.

Base temperature standards vary by country. For example, in the United States the base figure is 65 °F while in the UK it is 15,5 °C. Reporting cities shall provide base temperature standards as additional information.

Those implementing this document shall use the method and base temperature given in the specific standard for their country.

Cities should describe the location of the temperature measurements to convey the local representativeness of the reported values (e.g. airport, city centre).

7.8.2 Cooling degree days (profile indicator)

7.8.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Degree days indicate the energy demands of buildings as a response to their local and regional climate. "Heating" degree days is a measure of the space heating requirements of buildings, while "cooling" degree days is a measure of the space cooling requirements.

7.8.2.2 Profile indicator requirements

Cooling degree days shall be calculated by subtracting the mean daily air temperature from the standard baseline air temperature, and then summed for each day of the year to meet an annual total. If the temperature difference is a negative number, it shall be omitted from the calculation. The result shall be expressed as cooling degree days.

Base temperature standards vary by country. For example, in the United States the base figure is 65 °F while in the UK it is 15,5 °C. Reporting cities shall provide base temperature standards as additional information.

Those implementing this document shall use the method and base temperature given in the specific standard for their country.

Cities should describe the location of the temperature measurements to convey the local representativeness of the reported values (e.g. airport, city centre).

8 Environment and climate change

8.1 Fine particulate matter (PM_{2.5}) concentration (core indicator)

8.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Fine particulate matter can cause major health problems in cities. According to the WHO, any concentration of particulate matter (PM) is harmful to human health. PM is carcinogenic and harms the circulatory system as well as the respiratory system. As with many other air pollutants, there is a connection with questions of environmental justice, since underprivileged citizens can often suffer from stronger exposure. The evidence on PM and its public health impact is consistent in showing adverse health effects at exposures that are currently experienced by urban populations in both developed and developing countries. The range of health effects is broad, but predominantly associated with the respiratory and cardiovascular systems.

NOTE 2 This indicator reflects the “Living & working environment” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” and “Well-being” purposes of the city as defined in ISO 37101.

8.1.2 Core indicator requirements

Fine particulate matter (PM_{2.5}) concentration shall be calculated as the total mass of collected particles that are 2,5 µm or less in diameter (numerator) divided by the volume of air sampled in standard cubic metres (µg/m³) (denominator). The result shall be expressed as the concentration of PM_{2.5} in micrograms per standard cubic metre (µg/m³).

The method for measurement shall involve the use of an air sampler which draws ambient air at a constant flow rate into a specially shaped inlet where the suspended particulate matter is inertially separated into one or more size fractions within the PM_{2.5} size range. The 24-h (daily) measurements of PM_{2.5} concentrations are forwarded to a database where yearly summaries for each monitoring station are computed.

NOTE Since data for PM_{2.5} are not readily available, levels are often calculated on the basis of PM₁₀ emission and this is reported as a separate indicator.

Cities should describe the location of each monitoring station to convey the local representativeness of the measured values (e.g. airport, city centre, industrial park). Ideally, multiple station locations should be used to determine a spatial average for the city.

8.2 Particulate matter (PM₁₀) concentration (core indicator)

8.2.1 General

Those implementing this document shall report on this indicator (unless reporting on PM_{2.5} under [8.1](#)) in accordance with the following requirements.

NOTE 1 The evidence on airborne PM and its public health impact is consistent in showing adverse health effects at exposures that are currently experienced by urban populations in both developed and developing countries. PM poses a health concern because it can be inhaled and accumulate in the respiratory system.

People with heart or lung disease, older adults and children are considered at greater risk to particle pollution. Long-term exposures (annual mean) to particles, such as those experienced by people living for many years in areas with high particle levels, have been associated with problems such as reduced lung function, the development of chronic bronchitis and even premature death. Short-term exposures (24 h) to particles can aggravate lung diseases, causing asthma attacks and acute bronchitis, and may also increase susceptibility to respiratory infections. High particle pollution in major cities have major negative impacts on economic/business growth due to a decline in foreign investors. According to the World Health Organization^[12], air pollution is estimated to cause approximately 2 million premature

deaths worldwide per year. In many cities, the average levels of PM10 exceed 70 µg per cubic metre (µg/m³).

NOTE 2 This indicator reflects the “Living & working environment” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” and “Well-being” purposes of the city as defined in ISO 37101.

8.2.2 Core indicator requirements

Particulate matter (PM10) concentration shall be calculated as the total mass of collected particles in micrograms in the PM10 size range (numerator) divided by the volume of air sampled in standard cubic metres (denominator). The result shall be expressed as the concentration of PM10 in micrograms per standard cubic metre (µg/m³).

The method for measurement shall involve the use of an air sampler which draws ambient air at a constant flow rate into a specially shaped inlet where the suspended particulate matter is inertially separated into one or more size fractions within the PM10 size range. “Respirable particulate matter” or PM10 particles are defined as greater than 2,5 µm and less than or equal to 10 µm in diameter. The 24-h (daily) measurements of PM10 concentrations are forwarded to a database where yearly summaries for each monitoring station are computed.

NOTE Particulate matter is a mixture of microscopic solids and liquid droplets suspended in air. These particulates are made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mould spores). Coarse particles are greater than 2,5 µm and less than or equal to 10 µm in diameter and are defined as “respirable particulate matter” or PM10. Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads.

Cities should describe the location of each monitoring station to convey the local representativeness of the measured values (e.g. airport, city centre, industrial park). Ideally, multiple station locations should be used to determine a spatial average for the city.

8.3 Greenhouse gas emissions measured in tonnes per capita (core indicator)

8.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The greenhouse gas emissions from all activities within the city are an indicator of the adverse contribution the city is making to climate change.

NOTE 2 This indicator reflects the “Biodiversity and Ecosystem Services” and “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” purpose of the city as defined in ISO 37101.

8.3.2 Core indicator requirements

The greenhouse gas emissions measured in tonnes per capita shall be measured as the total amount of greenhouse gases in tonnes (equivalent carbon dioxide units) generated over a calendar year by all activities within the city, including indirect emissions outside city boundaries (numerator) divided by the current population of the city (denominator). The result shall be expressed as the total greenhouse gas emissions per capita in tonnes.

The total aggregate tonnage (expressed as equivalent carbon dioxide units of greenhouse gas) of greenhouse gas emissions shall be calculated for all activities within the city for the preceding 12 months.

The Global Protocol for Community-Scale GHG Emissions (GPC), (2012 Accounting and Reporting Standard) refers to a multi-stakeholder consensus-based protocol for developing internationally recognized and accepted community-scale greenhouse gas accounting and reporting. This protocol

defines the basic emissions sources and categories within sectors for a community-scale GHG inventory, in order to standardize GHG inventories between communities and within a community over time. The protocol provides accounting methodologies and step-by-step guidance on data collection, quantification and reporting recommendations for each source of emissions.

Both emissions sources and sector categorizations reflect the unique nature of cities and their primary emissions sources. These include emissions from: 1) stationary units, 2) mobile units, 3) waste and 4) industrial process and product use sectors. For further specifications, refer to the full GPC methodology. Local governments shall be expected to provide information (i.e. quantified emissions) for each of these emission sources.

In order to address the issue of inter-city sources of emissions that transcend more than one jurisdictional body, the GPC integrates the GHG Protocol Scope definitions, as follows:

Scope 2 emissions: energy-related indirect emissions that occur as a consequence of consumption of grid-supplied electricity, heating and/or cooling, within the community's geopolitical boundary.

Scope 3 emissions: all other indirect emissions that occur as a result of activities within the community's geopolitical boundary.

For step-by-step guidance on data and accounting collection, see Section 3 of the GPC. http://www.ghgprotocol.org/sites/default/files/ghgp/standards/GHGP_GPC_0.pdf

NOTE Greenhouse gases (GHGs) are gases in the atmosphere that absorb infrared radiation that would otherwise escape to space, thereby contributing to rising surface temperatures. There are six major GHGs: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆). The warming potential for these gases varies from several years to decades to centuries.

Users can also consult the ISO 14064 series^[82–84] on *Greenhouse Gases* for further guidance.

8.4 Percentage of areas designated for natural protection (supporting indicator)

8.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Natural areas play an important role in conserving biodiversity and maintaining ecological processes and natural cycles which serve to benefit the natural and human environment. Natural areas also serve as potential economic hubs by drawing in recreational users into and around the area.

NOTE 2 A protected area is a clearly defined geographical space, recognized, dedicated and managed through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services (International Union for Conservation of Nature).

NOTE 3 This indicator reflects the “Biodiversity and Ecosystem Services” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” purpose of the city as defined in ISO 37101.

8.4.2 Supporting indicator requirements

The percentage of areas designated for natural protection shall be calculated as the total land area of designated natural protection and/or biodiversity (numerator) divided by the total land area of the city (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Areas designated for natural protection and/or biodiversity shall refer to areas under municipal, communal, natural and/or local protection/biodiversity schemes.

8.5 NO₂ (nitrogen dioxide) concentration (supporting indicator)

8.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 NO₂ (nitrogen dioxide) is a major air pollutant, which can have significant impacts on human health and the environment. NO₂ contributes to the formation of photochemical smog and at raised levels can increase the likelihood of respiratory problems. Nitrogen dioxide inflames the lining of the lungs, and it can reduce immunity to lung infections. This can cause problems such as wheezing, coughing, colds, flu and bronchitis. Increased levels of nitrogen dioxide can have significant impacts on people with asthma because it can cause more frequent and more intense attacks. NO₂ chemically transforms into nitric acid and contributes to acid rain. Nitric acid can corrode metals, fade fabrics and degrade rubber. When deposited, it can also contribute to lake acidification and can damage trees and crops, resulting in substantial losses.

NOTE 2 This indicator reflects the “Living & working environment” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” and “Well-being” purposes of the city as defined in ISO 37101.

8.5.2 Supporting indicator requirements

NO₂ concentration shall be calculated as the sum of daily concentrations for a whole year (numerator) divided by 365 days (denominator). The result shall be expressed as the annual average for daily NO₂ concentration in µg/m³.

The daily concentrations shall be determined by averaging the hourly concentrations throughout a 24-h period from all monitoring stations within the city.

Cities should describe the location of each monitoring station to convey the local representativeness of the measured values (e.g. airport, city centre, industrial park). Ideally, multiple station locations should be used to determine a spatial average for the city.

Users of this document should also note the frequency of NO₂ exposures. Peak exposure is determined by calculating the number of times the hourly mean exceeded 200 µg/m³ of NO₂ in a calendar year. Long-term exposure is determined by calculating the number of times the daily mean exceeded 40 µg/m³ of NO₂ in a calendar year.

8.5.3 Data sources

Hourly average concentrations are measured by monitoring equipment and reported to an air quality monitoring authority (e.g. City Environment Office, National Environment Office).

8.6 SO₂ (sulfur dioxide) concentration (supporting indicator)

8.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 SO₂ (sulfur dioxide) is a major air pollutant, which can have significant impacts on human health and the environment. Health effects caused by exposure to high levels of SO₂ include breathing problems, respiratory illness, changes in the lung's defences, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most sensitive to SO₂. It also damages trees and crops. SO₂, along with nitrogen oxides, are the main precursors of acid rain. This contributes to the acidification of lakes and streams, accelerated corrosion of buildings, reduced visibility and deforestation. SO₂ also causes formation of microscopic acid aerosols, which have serious health implications as well as contributing to climate change.

NOTE 2 This indicator reflects the “Living & working environment” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” and “Well-being” purposes of the city as defined in ISO 37101.

8.6.2 Supporting indicator requirements

SO₂ concentration shall be calculated as the sum of daily concentrations for the whole year (numerator) divided by 365 days (denominator). The result shall be expressed as the annual average for daily SO₂ concentration in µg/m³.

The daily concentration shall be determined by averaging the hourly concentrations throughout a 24-h period from all monitoring stations within the city.

Users of this document should also note the frequency of SO₂ exposures. Peak exposure is determined by calculating the number of times the 10-min mean exceeded 500 µg/m³ of SO₂ in a calendar year. Long-term exposure is determined by calculating the number of times the daily mean exceeded 20 µg/m³ of SO₂ in a calendar year.

Cities should describe the location of each monitoring station to convey the local representativeness of the measured values (e.g. airport, city centre, industrial park). Ideally, multiple station locations should be used to determine a spatial average for the city.

8.6.3 Data sources

Hourly average concentrations are measured by monitoring equipment and reported to an air quality monitoring authority (e.g. City Environment Office, National Environment Office).

8.7 O₃ (ozone) concentration (supporting indicator)

8.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 High concentrations of ozone in the ambient air are harmful for humans as well as plants. High concentrations of ozone can irritate the respiratory system and are linked to asthma, bronchitis and heart attacks. The elderly are especially vulnerable. There are links being made to ozone concentration and environmental justice, in particular with reference to underprivileged social groups with higher exposure and vulnerability.

NOTE 2 This indicator reflects the "Living & working environment" and "Health and care in the community" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Preservation and improvement of environment" and "Well-being" purposes of the city as defined in ISO 37101.

8.7.2 Supporting indicator requirements

O₃ (ozone) concentration shall be calculated as the sum of daily concentrations for the whole year (numerator) divided by 365 days (denominator). The result shall be expressed as the annual average for daily O₃ (ozone) concentration in µg/m³.

O₃ is normally monitored at 8-h intervals. To determine the 24-h average daily concentration, the three 8-h concentrations shall be determined and averaged over a 24-h period at all monitoring stations within the city's boundaries.

Cities should describe the location of each monitoring station to convey the local representativeness of the measured values (e.g. airport, city centre, industrial park). Ideally, multiple station locations should be used to determine a spatial average for the city.

Long-term exposure shall be determined by the number of days when the daily average concentration over an 8-h exposure exceeds 100 µg/m³. Long-term exposure should be noted.

8.8 Noise pollution (supporting indicator)

8.8.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Prolonged exposure to noise can lead to significant health effects, both physical and mental.

NOTE 2 This indicator reflects the “Living & working environment” and “Health and care in the community” issues as defined in ISO 37101[36]. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” and “Well-being” purposes of the city as defined in ISO 37101.

8.8.2 Supporting indicator requirements

Noise pollution shall be calculated by assessing the population exposed to noise pollution (the numerator), divided by the total population of the city (denominator). The result shall then be multiplied by 100 and expressed as the percentage of the population affected by noise pollution.

Noise pollution estimation is made by mapping the noise level L_{den} (day-evening-night) likely to cause annoyance as specified by ISO 1996-2, identifying the areas of the city where L_{den} is greater than 55 dB(A) and estimating the population of those areas as a percentage of the total city population.

NOTE Noise pollution can also be recorded as L_n (night) and when exceeding 50 dB(A) is likely to cause sleep deprivation. Another useful indicator of the noise levels in a city is the degree of annoyance as specified in ISO/TS 15666:2003.

8.8.3 Data sources

Average levels are measured by monitoring equipment and reported to an air quality monitoring authority (e.g. City Environment Office, National Environment Office).

8.9 Percentage change in number of native species (supporting indicator)

8.9.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Urbanization affects biodiversity through urban sprawl/habitat fragmentation, loss of fertile agricultural lands and spread of invasive alien species. A loss in biodiversity threatens food supplies, lessens opportunities for recreation and tourism, and impacts a diverse range of medicinal sources, varieties of wood and energy. It also interferes with essential ecological function, such as carbon sequestration and air filtering. The net change in the number of native species in a municipality is an indication of biological diversity loss or gain.

NOTE 2 This indicator reflects the “Biodiversity and Ecosystem Services” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” purpose of the city as defined in ISO 37101.

8.9.2 Supporting indicator requirements

The percentage change in number of native species shall be calculated as the total net change in species (numerator) divided by the total number of species from the five taxonomic groups from most recent survey (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The net change in species shall be calculated as the number of new species within the city (as documented in the most recent survey) from the three core taxonomic groups and the city’s selection of an additional two taxonomic groups (as a result of, for example, reintroduction, rediscovery, new species found) subtracted by the number of species that have become extirpated or locally extinct within the city (relative to past surveys).

The three core taxonomic groups shall refer to vascular plants, birds and butterflies. Additional taxonomic groups that cities should select can include the following: mammals, insects, bryophytes, fungi, amphibians, reptiles, freshwater fish, molluscs, dragonflies, carabid beetles, spiders, hard corals, marine fish, seagrasses and sponges. A full list can be found in the User's Manual for the City Biodiversity Index^[85].

The timeframe of species change is essential to interpretation of reported values. Cities shall report the date of surveys used to calculate the change in number of native species.

8.9.3 Data sources

Possible sources of data include government agencies in charge of biodiversity, city municipalities, urban planning agencies, city forestry departments, biodiversity centres, nature groups and universities.

9 Finance

NOTE Standard accounting principles are used whenever possible in these indicators. Using too much detail in the definition of municipal finance can cause difficulties.

9.1 Debt service ratio (debt service expenditure as a percentage of a city's own-source revenue) (core indicator)

9.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Widely accepted as a measure of sound financial management, this indicator reflects the amount of financial resources that are available for day-to-day operations and how much money is spent paying down debt. It can be a controllable cost and can assist in priority setting.

NOTE 2 This indicator reflects the "Governance, empowerment and engagement" and "Economy and sustainable production and consumption" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Resilience" and "Responsible resource use" purposes of the city as defined in ISO 37101.

9.1.2 Core indicator requirements

Debt service ratio shall be calculated as the total long-term debt servicing costs (numerator) divided by total own-source revenue (denominator). The result shall then be multiplied by 100 and expressed as debt service expenditure as a percentage of a city's own-source revenue.

Long-term debt servicing costs shall include lease payments, temporary financing and other debt charges. Total own-source revenue shall be calculated as the total revenue minus transfers of revenues from other levels of government.

Own-source revenues represent the portion of local government revenues that originate from fees, charges and taxes as permitted by law or legislation, in contrast to all other revenues, including those provided by other levels of government. Own-source revenue may also include municipal shares in income and value-added taxes, since these are a stable source of revenue for many municipalities.

9.1.3 Data interpretation

A lower number may indicate either an increased ability to borrow or a decision by a city to limit its debt to enable funding of other service areas.

Take care when evaluating this indicator. A high debt service ratio may indicate a city that has taken on too much debt but it may also indicate that the city has taken an aggressive approach to debt repayment and is paying down their debt quickly. Similarly, a low debt service ratio could indicate a city is strong financially and can finance most capital projects through alternative funding sources. It may

also indicate that a city is financially weaker and has deferred capital projects and allowed important infrastructure to deteriorate.

9.2 Capital spending as a percentage of total expenditures (core indicator)

9.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The amount of capital expenditure by the city expressed as a percentage of the total city expenditure is an indicator of capital reinvestment and the fiscal health of the city.

NOTE 2 This indicator reflects the “Governance, empowerment and engagement” and “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Resilience” and “Responsible resource use” purposes of the city as defined in ISO 37101.

9.2.2 Core indicator requirements

Capital spending as a percentage of total expenditures shall be calculated as the total expenditure on fixed assets in the preceding year (numerator) divided by the total expenditure (operating and capital) (denominator) by the city in that same period. The result shall then be multiplied by 100 and expressed as capital spending as a percentage of total expenditures.

Capital spending shall refer to the amount of money that has been allocated for funding projects such as transit construction and repair, roads, bridges, public buildings and infrastructure.

Cities should be precise when describing the calculation method and, in particular, the range of sectors included in the calculation.

NOTE Fixed assets are not expected to be consumed or converted into cash in the normal course of business. They are long-term, more permanent or “fixed” items, such as land, building, equipment, fixtures, furniture and leasehold improvements.

9.2.3 Data sources

The figures used in this calculation should be taken directly from the city’s audited financial statements without amendment or variation.

9.2.4 Data interpretation

This indicator needs to be considered in conjunction with the debt service ratio indicator to obtain an understanding of the city’s capacity to maintain its capital expenditure. The level of capital expenditure in relation to recurrent expenditure may reflect the city’s financial capacity to invest in capital items needed to support future growth and development.

9.3 Own-source revenue as a percentage of total revenues (supporting indicator)

9.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 On a very basic level, this indicator measures the level of dependence of the city on other levels of government for revenues to deliver its services to the public. The balance between own source of income and senior level government transfers provides an indication of a city’s viability, independence and control over its own resources and can reveal a city’s ability to be effective in financial planning and management.

NOTE 2 This indicator reflects the “Governance, empowerment and engagement” and “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Resilience” and “Responsible resource use” purposes of the city as defined in ISO 37101.

9.3.2 Supporting indicator requirements

Own-source revenue as a percentage of total revenues shall be calculated as the total amount of funds obtained through permit fees, user charges for city services and taxes collected for city purposes only (numerator) divided by all operating or reoccurring revenues, including those provided by other levels of government transferred to the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Own-source revenues represent the portion of local government revenues that originate from fees, charges and taxes as permitted by law or legislation, in contrast to all other revenues, including those provided by other levels of government. Own-source revenue may also include municipal shares in income and value-added taxes, since these are a stable source of revenue for many municipalities.

9.4 Tax collected as a percentage of tax billed (supporting indicator)

9.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 This indicator measures the ratio of the actual tax collected to the mandated tax. Tax collected is a major source of income for all levels of government including cities. The indicator thus reflects the effectiveness of a city’s financial management capabilities and to some extent can be a proxy of the willingness of citizens to pay taxes.

NOTE 2 This indicator reflects the “Governance, empowerment and engagement” and “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Resilience” and “Responsible resource use” purposes of the city as defined in ISO 37101.

9.4.2 Supporting indicator requirements

The tax collected as a percentage of tax billed shall be calculated as the total revenues generated by tax collection (numerator) divided by the amount of taxes that have been billed (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Tax collected shall refer to local taxes that are successfully collected by the municipality from citizens. These taxes include, for example, property (i.e. real estate) taxes.

Tax billed shall refer to mandatory financial charges levied on citizens by the municipal government for the purpose of funding public expenditures.

9.5 Finance profile indicators

9.5.1 Gross operating budget per capita (USD) (profile indicator)

9.5.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Gross operating budget per capita provides a measure to understand the amount which local governments spend on their operating budgets in a simple way to allow for greater comparability between cities.

9.5.1.2 Profile indicator requirements

The gross operating budget per capita shall be calculated as the gross operating budget (numerator) divided by the population of the city (denominator). The result shall be expressed in USD.

An operating budget refers to the annual budget of government operations according to budget classification code, functional/sub-functional categories and cost accounts. It contains estimates of the total value of resources required for the performance of the operation including reimbursable work or services for others. The operating budget is used in particular to keep track of maintenance operations, salaries and interest payments.

9.5.2 Gross capital budget per capita (USD) (profile indicator)

9.5.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE A city's capital budget is a reserved fund for upgrades and additions to city services and infrastructure to make a city more liveable and attractive.

9.5.2.2 Profile indicator requirements

The gross capital budget per capita shall be calculated as the gross capital budget (numerator) divided by the population of the city (denominator). The result shall be expressed in USD.

A capital budget is the amount of money that has been allocated for funding projects such as transit construction and repair, roads, bridges, public buildings, infrastructure facilities, parks and other major infrastructure upgrades or additions. The gross capital budget is the combined amount of money that has been allocated annually to go towards spending on these projects.

10 Governance

10.1 Women as a percentage of total elected to city-level office (core indicator)

10.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of women elected to city-level office is a direct reflection of inclusiveness in governance.

NOTE 2 This indicator reflects the "Governance, empowerment and engagement" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Social Cohesion" purpose of the city as defined in ISO 37101.

10.1.2 Core indicator requirements

Women as a percentage of total elected to city-level office shall be calculated as the total number of elected city-level positions held by women (numerator) divided by the total number of elected city-level positions (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of elected city-level positions shall refer to the number of places on the city council or in city government that are directly elected. This shall include elected managerial roles such as sheriff and comptroller, where relevant.

10.2 Number of convictions for corruption and/or bribery by city officials per 100 000 population (supporting indicator)

10.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The principles of governance include selflessness, objectivity, accountability, openness, honesty and leadership. The number of convictions for corruption/bribery can reflect the extent to which governance adheres to these core principles.

NOTE 2 This indicator reflects “Governance, empowerment and engagement” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion” purpose of the city as defined in ISO 37101.

10.2.2 Supporting indicator requirements

The number of convictions for corruption and/or bribery by city officials per 100 000 population shall be calculated as the total number of convictions for corruption and/or bribery by city officials (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of convictions for corruption and/or bribery by city officials per 100 000 population.

City officials shall refer to elected or employed representatives of the city.

10.3 Number of registered voters as a percentage of the voting age population (supporting indicator)

10.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Determining the percentage of the number of registered voters from the voting age population can reveal the legitimacy and quality of the electoral process in a city. For citizens to exercise their democratic right to vote there must be a comprehensive and inclusive electoral register, also called a voters list. This must be carefully maintained to ensure that each eligible citizen is registered to vote once and only once. A voters list makes it possible to separate two of the most important functions of the election authority: verifying voter eligibility and controlling the legitimacy of the balloting process.

NOTE 2 This indicator reflects the “Governance, empowerment and engagement” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion” purpose of the city as defined in ISO 37101.

10.3.2 Supporting indicator requirement

The number of registered voters as a percentage of the voting age population shall be calculated as the total number of registered voters, as determined by the official voter register (numerator) divided by the voting age population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Number of registered voters shall refer to the number of names on the voters register at the time that the registration process closes (cut-off date), as reported by the election authority. The election authority should use one of three options for voter registration: a periodic list, a continuous register/list or a civil registry. Any one of these options can determine the number of registered voters.

Voting age population shall include all citizens of legal voting age.

NOTE Voting age population is not necessarily an exact measure of the number of citizens entitled to vote as it does not take into account legal or systemic barriers to the exercise of the franchise or account for non-eligible members of the population, such as resident non-citizens or in some jurisdictions persons serving a sentence of imprisonment in a penal or correctional institution [the voting eligible population (VEP) would capture these discrepancies but it is very hard to achieve the data required to measure VEP]. However, in some countries, non-citizens, such as immigrants, have been granted the legal right to vote in municipal elections before they become citizens.

10.4 Voter participation in last municipal election (as a percentage of registered voters) (supporting indicator)

10.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the registered voting population that voted in the last municipal election is an indicator of the public's level of participation and degree of interest in local government.

NOTE 2 This indicator reflects the "Governance, empowerment and engagement" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Social Cohesion" purpose of the city as defined in ISO 37101.

10.4.2 Supporting indicator requirements

The voter participation in the last municipal election (as a percentage of registered voters) shall be calculated as the number of persons who voted in the last municipal election (numerator) divided by the total number of registered voters (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

"Persons who voted in the last election" is equivalent to voter turnout, measured by the total number of votes cast, whether positive, negative, valid or invalid.

There is a distinction between eligible to vote and registered to vote. In some countries, people have to register (actively) to be allowed to vote. In all other countries, eligible and registered voters are one and the same. This should be noted.

10.4.3 Data sources

Information should be obtained from the local authorities, officials or the Ministry responsible for local governments.

10.4.4 Data interpretation

This indicator will only reveal the level of participation, not the level of satisfaction of the population. In some cases, high rates of participation will mean that the population is not satisfied with its local government's leadership and actions. A result of zero shall indicate that local government is not directly elected by citizens; a result of 100 % may reflect voting that is mandatory in the local election.

11 Health

NOTE Indicators [21.3](#) and [21.4](#) can also contribute to health.

11.1 Average life expectancy (core indicator)

11.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Life expectancy reflects the overall mortality level of a population. Life expectancy is closely connected with health conditions, which are an integral part of development. Mortality is also one of the variables that determine the size of human populations and their potential for future growth. Life expectancy at birth is also a measure of overall quality of life in a country and summarizes mortality at all ages. It can also be thought of as indicating the potential return on investment in human capital and is necessary for the calculation of various actuarial measures.

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

11.1.2 Core indicator requirements

The average life expectancy shall be calculated as the average number of years to be lived by a group of people born in the same year, if health and living conditions at the time of their birth remained the same throughout their lives[3][84].

NOTE If data are categorized by gender, cities are encouraged to specify the respective life expectancies for males and females during reporting of the overall average life expectancy.

Cities shall report source of data, whether it is national or state level, and specify the level.

11.2 Number of in-patient hospital beds per 100 000 population (core indicator)

11.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The number of in-patient hospital beds is one of the few available indicators which monitor the level of a health service delivery. Service delivery is an important part of health systems, and in-patient hospital bed density is one of the few indicators that can be collected worldwide (WHO, 2006)[12].

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Attractiveness” purposes of the city as defined in ISO 37101.

11.2.2 Core indicator requirements

The number of in-patient hospital beds per 100 000 population shall be calculated as the total number of in-patient public and private hospital beds (numerator), divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of in-patient public and private hospital beds per 100 000 population.

Hospital beds shall include in-patient and maternity beds. This shall include beds in wards which are closed for reasons such as lack of health staff and building works. It shall also include beds for patients admitted who require continual assistance, incubators and specialized care. It may not include day-care beds, pre-anaesthesia beds, wake-up beds, beds for members of a patient's family and beds for hospital staff[6].

Cities shall also report the percentage of in-patient beds in privately owned or managed hospitals.

11.2.3 Data sources

Data on this indicator should be obtained from public and private in-patient facilities. Data may also come from censuses of healthcare facilities.

11.3 Number of physicians per 100 000 population (core indicator)

11.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The availability of physicians is an important indicator of the strength of a city's health system. There is evidence that the number of physicians is positively associated with immunization coverage, outreach of primary care, and infant, child and maternal survival (WHO, 2006).^[12] In this document physicians are also referred to as doctors.

NOTE 2 This indicator reflects the "Health and care in the community" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Attractiveness" purposes of the city as defined in ISO 37101.

11.3.2 Core indicator requirements

The number of physicians per 100 000 population shall be calculated as the number of general or specialist physicians whose workplace is in the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of physicians per 100 000 population.

A physician shall refer to someone who has obtained a graduate degree from a school of medicine, and whose work-place is in the city. A physician shall include general practitioners and specialists.

This indicator shall include physicians who are full-time equivalent (FTE), in order to capture doctors working part-time in hospitals and in practices.

11.3.3 Data sources

Cities should report the number of physicians based on administrative records such as registered physicians in the city. Information may also be obtained from the census, labour force statistics or other surveys which inquire about occupation.

The accuracy and completeness of the human resource data in countries can be a problem because databases are not updated frequently, private sector data are often not included and definitions of workers vary. It is for this reason that yearly updated data sources, such as administrative records, should be used. The definition presented above shall be the definition used when gathering data to report on this indicator.

11.4 Under age five mortality per 1 000 live births (core indicator)

11.4.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The under-5 mortality rate is a leading indicator of the level of child health and overall development in cities. Child mortality is an indicator of the status of the city as a healthy or unhealthy place to live. In addition, mortality rates are among the most frequently used indicators to compare levels of socioeconomic development across countries. Improving child mortality rates is a vital component of the Sustainable Development Goals, Goal 3: Ensure Healthy Lives and Promote Well-being for All at All Ages^[22].

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

11.4.2 Core indicator requirements

The under age five (under-5) mortality per 1 000 live births shall refer to the probability of a child born in a specified year dying before reaching the age of 5, and shall be expressed as a rate per 1 000 live births.

NOTE The under-5 mortality rate is, strictly speaking, not a rate (i.e. the number of deaths divided by the number of population at risk during a certain period of time) but a probability of death derived from a life table and expressed as rate per 1 000 live births.

Age-specific mortality rates among children and infants shall be calculated from birth and death data derived from vital registration, census and/or household surveys. Estimates based on household surveys data shall be obtained:

- a) directly, using birth history, as in demographic and health surveys; or
- b) indirectly, using the Brass method, as specified in the Multiple Indicator Cluster Surveys^[26].

The data shall then be summed for children under age 5 and shall be expressed as a rate per 1 000 live births.

11.4.3 Data sources

At the city level, data are available from complete vital statistics registration systems covering at least 90 % of vital events in the population. However, such systems are uncommon in developing countries, so estimates may be obtained from sample surveys or derived from direct and indirect estimation techniques to registration, census or survey data.

In developing countries, household surveys are essential to the calculation of this indicator, but there are some limits to their quality. Survey data are subject to recall error, and surveys estimating under-5 deaths require large samples, because such incidences are uncommon and representative households cannot ordinarily be identified by the sampling. Moreover, the frequency of the survey is generally only every 3 to 5 years. When using household surveys the user shall take sampling errors into account. Also, indirect estimates rely on estimated actuarial (“life”) tables that could be inappropriate for the population concerned.

11.5 Number of nursing and midwifery personnel per 100 000 population (supporting indicator)

11.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The number of nursing and midwifery personnel is a good indication of the city’s health system and the strength of its outreach for maternal health.

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Attractiveness” purposes of the city as defined in ISO 37101.

11.5.2 Supporting indicator requirements

The number of nursing and midwifery personnel per 100 000 population shall be calculated as the total number of nurses and midwives (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of nursing and midwifery personnel per 100 000 population.

The number of nurses and midwives shall include actively practising nurses and midwives employed in public and private hospitals, clinics and other health facilities, including officially registered self-employed nurses and midwives. Both fully-qualified nurses with post-secondary education in nursing and vocational/associate/auxiliary/practical nurses with a lower level of nursing skills, but also usually registered, shall be reported.

NOTE Some figures might be underestimated or overestimated when it is not possible to distinguish whether the data includes health workers in the private sector, double counts of health workers holding two or more jobs at different locations, health service providers working outside the healthcare sector (e.g. nurses working in a school or large private company), workers who are unpaid or unregulated but performing healthcare tasks (e.g. volunteer community health workers) or people with health vocational training who are not currently engaged in the national health labour market (e.g. unemployed, migrated, retired or withdrawn from the labour force for personal reasons).

11.6 Suicide rate per 100 000 population (supporting indicator)

11.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Suicide rate is a serious issue in many cities and reflects on mental health, which is central to human development.

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Social Cohesion” purposes of the city as defined in ISO 37101.

11.6.2 Supporting indicator requirements

The suicide rate per 100 000 population shall be calculated as the total number of reported deaths by suicide (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of deaths by suicide per 100 000 population.

Death by suicide shall refer to acts deliberately initiated and performed by a person who fully acknowledges the fatal outcome of such acts.

11.6.3 Data sources

This information should be obtained from the coroner’s office, regional health authority or national census.

NOTE Suicides are not always reported as such. In particular, suicides can sometimes be reported as homicides or accidents.

12 Housing

12.1 Percentage of city population living in inadequate housing (core indicator)

12.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the population living in inadequate housing is an indicator of the number of persons living in substandard housing conditions. Inadequate housing contributes to greater rates of infectious and chronic diseases. Other studies have shown that inadequate housing can contribute to poor child development.

NOTE 2 This indicator reflects the “Health and care in the community” and “Living together, interdependence and mutuality” and “Living & working environment” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Social Cohesion” purpose of the city as defined in ISO 37101.

12.1.2 Core indicator requirements

The percentage of the city population living in inadequate housing shall be calculated as the number of people living in inadequate housing (numerator) divided by the city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Inadequate housing shall refer to not meeting one or more of the following conditions:

- a) Housing in good repair: State of repair that will satisfy a respectable occupant using the premises for ordinary purposes, but not necessarily a state of repair desired by the tenant.
- b) Sufficient living area: A house is considered to provide a sufficient living area for the household members if not more than three people share the same room and an adequate kitchen unit.
- c) Adequate access to affordable services: A household is considered to have adequate access to services if it has a sufficient amount of water for family use; adequate access to sanitation if an excreta disposal system (either in the form of a private toilet or a public toilet shared with a reasonable number of people) is available to household members; access to electricity; and access to heating.

12.1.3 Data sources

Data for the above conditions should be gathered from census and survey data and information from agencies working with housing.

12.2 Percentage of population living in affordable housing (core indicator)

12.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Housing can account for the highest amount of household spending; thus, a measure of affordability in a city can be attributed to the amount households spend on housing as a percentage of household income.

NOTE 2 This indicator reflects the “Living together, interdependence and mutuality” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion”, Attractiveness” and “Resilience” purposes of the city as defined in ISO 37101.

12.2.2 Core indicator requirements

The percentage of the population living in affordable housing shall be calculated as the total number of households that do not surpass local, regional, provincial or national regulations on housing affordability based on a percentage of household income spending on income (numerator) divided by the total number of households (denominator). The result shall be multiplied by 100 and expressed as a percentage.

NOTE The threshold figure is based on a percentage a household spends on housing relative to overall income. The specific percentage will change based on local regulations and standards regarding housing affordability. For example, in Canada the housing affordability threshold is surpassed when a household spends more than 30 % of its income on housing. In France, the threshold is 40 %.

12.2.3 Data sources

Information should be gathered from census and survey data or from agencies and authorities working with housing.

12.3 Number of homeless per 100 000 population (supporting indicator)

12.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Having a home to live in can be considered a basic need. There might be several reasons for a homeless situation, such as the housing price to income ratio^[40].

NOTE 2 This indicator reflects the “Living together, interdependence and mutuality” and “Living & working environment” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion”, “Resilience” and “Well-being” purposes of the city as defined in ISO 37101.

12.3.2 Supporting indicator requirements

The number of homeless per 100 000 population shall be calculated as the total number of homeless people (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of homeless per 100 000 population.

The following definition is used by the United Nations^[41] to define homelessness: ‘Homelessness refers to those without any physical shelter, for example, those living outside, in parks, in doorways, in parked vehicles, or parking garages, as well as those in emergency shelters or in transition houses for women fleeing abuse.’

12.4 Percentage of households that exist without registered legal titles (supporting indicator)

12.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Understanding the percentage of households that exist without registered legal titles informs municipal leaders on housing security for city residents as well as housing conditions and infrastructure requirements, and builds a better database for less formal parts of the city.

NOTE 2 This indicator reflects the “Governance, empowerment and engagement” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion” and “Resilience” purposes of the city as defined in ISO 37101.

12.4.2 Supporting indicator requirements

The percentage of households that exist without registered legal titles shall be calculated as the number of households that exist without registered legal titles (numerator) divided by the total number of households (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Unregistered legal title shall include the following tenure types: unregistered lease or leaseholds, rental, ownership title, occupancy right and use right (including sub-lease, sub-rental, co-tenancy, and co-occupancy right).

12.5 Housing profile indicators

12.5.1 Total number of households (profile indicator)

12.5.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE This indicator provides general insight for local authorities to develop a stronger understanding of the current and future needs of their city.

12.5.1.2 Profile indicator requirements

The total number of households shall be calculated as the sum of all individual households within city boundaries.

A household shall refer to a person or a group of persons who occupy the same dwelling and do not have a usual place of residence elsewhere in the city. It may consist of: a family group with or without other persons; two or more families sharing a dwelling; a group of unrelated persons; or one person living alone.

12.5.2 Persons per unit (profile indicator)

12.5.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Persons per unit can provide indication into crowded or underutilized living spaces within cities.

12.5.2.2 Profile indicator requirements

The total number of persons per unit shall be calculated as the total number of persons living in a city (numerator) divided by the total number of dwelling units in the city (denominator). The result shall be expressed as the total number of persons per unit.

A dwelling unit shall refer to a separate set of living quarters which has a private entrance, and in which a person or a group of persons live permanently.

12.5.3 Vacancy rate (residential) (profile indicator)

12.5.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE This indicator can provide general insight for local authorities to develop a stronger understanding of the current and future housing needs of their city.

12.5.3.2 Profile indicator requirements

The vacancy rate (residential) shall be calculated as the number of unoccupied dwellings (numerator) divided by total number of dwellings in the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

A vacant dwelling is an unoccupied dwelling corresponding to one of the following cases:

- for sale or rent;

- already attributed to a buyer or a tenant, and awaiting occupation;
- pending succession settlements;
- kept by an employer for future use by one of their employees;
- kept vacant and without specific attribution by the owner (e.g. a run-down property).

12.5.3.3 Data interpretation

A minimum of vacant dwellings is necessary to ensure a good flow in the housing market. Conversely, a vacancy rate that is too high can indicate a decline in housing demand or attractiveness, a degree of speculation in the housing market or a mismatch between housing supply and demand.

12.5.4 Living space (square metres) per person (profile indicator)

12.5.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Living space (square metres) per person can provide an indication of crowded or underutilized dwelling units within cities.

12.5.4.2 Profile indicator requirements

Living space per person shall be calculated as the total area of all dwelling units in a city (numerator) divided by the total number of persons living in the dwelling units (denominator). The result shall be expressed as the living space per person in square metres.

Living space shall refer to construction area of a dwelling unit, namely the floor area of the unit building (including the wall). Cities should specify exactly what is included in the calculation of living space, which may include the area of the appendages attached to the unit, such as outdoor balcony, corridor, stairs, awning and eaves galleries.

A dwelling unit shall refer to a separate set of living quarters which has a private entrance, and in which a person or a group of persons live permanently.

12.5.5 Secondary residence rate (profile indicator)

12.5.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE This indicator can provide general insight for local authorities to develop a stronger understanding of the supply and use of housing in the city and better plan for the current and future housing needs of their city.

12.5.5.2 Profile indicator requirements

The secondary residence rate shall be calculated as the number of secondary dwelling units (numerator) divided by the total number of dwelling units in the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

A secondary residence (dwelling unit) shall refer to dwelling units in addition to a principal residence. Additional dwelling units rented or for rent are also classified as a secondary residence.

12.5.6 Residential rental dwelling units as a percentage of total dwelling units (profile indicator)

12.5.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE This indicator provides general insight for local authorities to develop a stronger understanding of the current and future housing supply to better plan and support housing needs in the city.

12.5.6.2 Profile indicator requirements

Residential rental dwelling units as a percentage of total dwelling units shall be calculated as the total number of residential rental dwelling units in the city (numerator) divided by the total number of dwelling units in the city (denominator). The result shall be multiplied by 100 and expressed as a percentage.

A rental dwelling unit shall refer to a separate set of living quarters which has a private entrance, and which is rented to a person or a group of persons.

13 Population and social conditions

13.1 Percentage of city population living below the international poverty line (core indicator)

13.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the city's population living below the international extreme poverty threshold is an indicator of absolute poverty. It reflects social equity and reflects levels of economic and social marginality and/or inclusiveness in a city. Eradication of extreme poverty is an essential component of the Sustainable Development Goals[22].

NOTE 2 This indicator reflects the "Living together, interdependence and mutuality" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Social cohesion" purposes of the city as defined in ISO 37101.

13.1.2 Core indicator requirements

The percentage of the city population living below the international poverty line shall be calculated as the number of people living below the international extreme poverty threshold set by the United Nations (numerator) divided by the total current population of the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The total number of people in the city living below the United Nations international extreme poverty threshold shall be determined by multiplying the number of city households at or below the poverty line by the current average number of persons per household for that city.

NOTE Internationally, people living in extreme poverty is currently defined by the United Nations as those living on less than US\$1,25 a day (Sustainable Development Goals, Goal 1: End Poverty in All its Forms Everywhere)[22].

13.1.3 Data interpretation

Applying the current average persons per household figure to all households can lower distinctions between household size in poor and more affluent households, that is, it could have the effect of underestimating the actual number of people who live below the poverty line.

13.2 Percentage of city population living below the national poverty line (supporting indicator)

13.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the city's population living below the national poverty line is an indicator of relative poverty. It reflects social equity and levels of economic and social marginality and/or inclusiveness in a city. Eradication of poverty is an essential component of the Sustainable Development Goals^[22].

NOTE 2 This indicator reflects the "Living together, interdependence and mutuality" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Social cohesion" purposes of the city as defined in ISO 37101.

13.2.2 Supporting indicator requirements

The percentage of the city population living below the national poverty line shall be calculated as the number of people living below the national poverty line set at country level (numerator) divided by the total current population of the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The total number of people in the city living below the national poverty line shall be determined by multiplying the number of city households at or below the national poverty line by the current average number of persons per household for that city.

The poverty threshold, poverty limit or poverty line refers to the minimum level of income deemed adequate in a particular country. Cities shall report their definition of the national poverty line set at country level.

13.2.3 Data interpretation

Applying the current average persons per household figure to all households can lower distinctions between household size in poor and more affluent households, that is, it could have the effect of underestimating the actual number of people who live below the poverty line.

13.3 Gini coefficient of inequality (supporting indicator)

13.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The Gini coefficient is a statistical measure of economic inequality. By analysing the distribution of income or consumption across a population, cities are able to quantify a society's relative inequality, as well as changes in inequality over time. The Gini coefficient is the most commonly used measure of inequality with results varying between values of 0, reflecting perfect equality, and 1, indicating complete inequality.

NOTE 2 This indicator reflects the "Living together, interdependence and mutuality" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Social cohesion" purpose of the city as defined in ISO 37101.

13.3.2 Supporting indicator requirements

The Gini coefficient of inequality shall be calculated as a ratio with values between 0 and 1: the numerator is the area between the Lorenz curve of the distribution and the uniform distribution line; the denominator is the area under the uniform distribution line.

The Gini coefficient (also known as the “Gini Index” or “Gini Ratio”) is a measure of statistical dispersion that quantifies inequality among incomes or levels of consumption.

The Lorenz Curve refers to the curve diagram illustrated in Figure 2. The Gini coefficient is defined as a ratio of the areas on the Lorenz curve diagram. If the area between the line of perfect equality and Lorenz curve is A, and the area under the Lorenz curve is B, then the Gini coefficient is $A / (A + B)$.

A coefficient of zero expresses perfect equality, where all income or consumption values are the same. Conversely, a coefficient of one expresses maximal inequality (i.e. where a single person receives 100 % of all income or accounts for 100 % of all consumption).

The Gini coefficient is represented graphically by the area between the Lorenz curve and the “line of perfect equality” (see Figure 2).

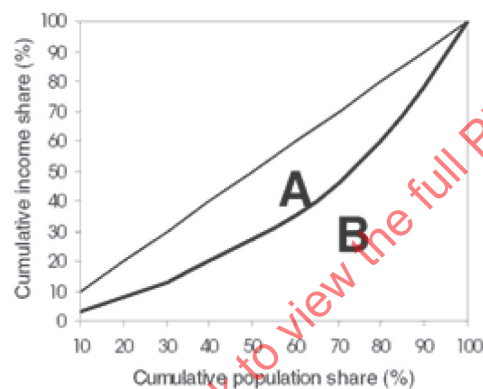


Figure 2 — Lorenz curve of income distribution

In this case, the Lorenz curve maps share of income on the y-axis against population distribution on the x-axis. Here 40 % of the population obtains roughly 20 % of total income. If every individual had the same income, the distribution curve would be a straight line. The Gini coefficient is thus calculated as the area A divided by the sum of areas A and B.

If income were distributed equally, then the Lorenz curve and the line of total equality would merge and the Gini coefficient would be 0. On the other hand, if one individual received all income, then the areas of A and B would be similar, resulting in a Gini value of 1.

13.3.3 Data sources

Information should be gathered from census and population survey data or from international UN sources that regularly calculate Gini coefficient.

13.4 Population and social conditions profile indicators

13.4.1 Annual population change (profile indicator)

13.4.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE With over half of the world's population choosing to locate in urban areas, population change within cities is an important metric to both know and forecast for planning purposes.

13.4.1.2 Profile indicator requirements

The annual population change shall be calculated as the city's current population minus the city's previous annual population (numerator) divided by the city's previous annual population (denominator). The result shall be multiplied by 100 and expressed as a percentage. The annual change should be split into natural balance and migratory balance.

13.4.2 Percentage of population that are foreign born (profile indicator)

13.4.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Immigrant populations will play a greater role in providing countries and municipalities with sustainable labour and revenue streams as birth rates decrease. Birth rates have tended to decline globally since the mid-1800s as women have tended to have fewer children and give birth later in life.

13.4.2.2 Profile indicator requirements

The percentage of the population that are foreign born shall be calculated as the total number of people who were born in a country other than that of the city (numerator) divided by the total city population (denominator). The result shall be multiplied by 100 and expressed as a percentage.

NOTE In some countries, foreign born does not include children born in a foreign country with native parents.

13.4.3 Population demographics (profile indicator)

13.4.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Population demographics are essential for constructing age pyramids, which show the distribution of age categories for a city population. They can also be used to calculate gender ratios.

13.4.3.2 Profile indicator requirements

The percentage of the population for each age category shall be calculated and recorded in [Table 2](#).

Table 2 — Population by age category and gender

	Male	Female	Total
Percentage of population that are children (aged 0–14)			
Percentage of population that are youths (aged 15–24)			
Percentage of population that are adults (aged 25–64)			
Percentage of population that are senior citizens (aged ≥ 65)			
Total population			
Population dependency ratio			

The population dependency ratio shall be calculated as the total child population under the age of 14 and the total senior population over the age of 65 summed (numerator) divided by the total working age population between the ages of 15 and 64 (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Children aged 14 or younger are considered a dependent subset of the population. This segment of the population is not considered to be in the workforce.

13.4.4 Percentage of population that are new immigrants (profile indicator)

13.4.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Immigrant populations will play a greater role in providing countries and municipalities with sustainable labour and revenue streams as birth rates decrease. Birth rates have tended to decline globally since the mid-1800s as women have tended to have fewer children and give birth later in life.

13.4.4.2 Profile indicator requirements

The percentage of the population that are new immigrants shall be calculated as the total population of new city immigrants (numerator) divided by the total city population (denominator). The result shall be multiplied by 100 and expressed as a percentage.

New immigrants shall refer to those people who have been in the city's country for less than 5 years.

13.4.5 Percentage of city population that are non-citizens (profile indicator)

13.4.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE The percentage of the city population that are non-citizens provides a general overview of the local population. Non-citizens could include people who are temporarily in the city for employment contracts or to pursue education. Knowledge of a city's non-citizen population can provide insight into municipal policies or programs.

13.4.5.2 Profile indicator requirements

The percentage of the city population that are non-citizens shall be calculated as the total city non-citizen population (numerator) divided by the city's total population (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Non-citizens shall refer to those people who routinely live in another country or city, and relatively transient populations which may not reside in the city permanently. Non-citizens may include people who are temporarily in the city for employment contracts or to pursue education.

NOTE The specific definition per country will vary slightly.

13.4.6 Number of university students per 100 000 population (profile indicator)

13.4.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE The number of students pursuing university education in a city has implications for urban planning, housing, economic development and quality of life.

13.4.6.2 Profile indicator requirements

The number of university students per 100 000 population shall be calculated as the total number of full- and part-time university students (numerator) divided by one 100 000th of the city population (denominator). The result shall be expressed as the number of university students per 100 000 population.

University students include those enrolled in forms of tertiary learning beyond that of secondary level in academic degree-granting institutions that offer undergraduate and postgraduate education across a range of disciplines and degrees, such as universities, colleges, institutes, academies, seminaries and trade schools that grant academic degrees and/or professional certifications.

14 Recreation

14.1 Square metres of public indoor recreation space per capita (supporting indicator)

14.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Recreation is an important aspect of city life, contributing to the health of citizens and the vitality of the city. Recreation is a service that many cities provide through a parks and recreation department or related office.

NOTE 2 This indicator reflects the “Living & working environment” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social cohesion” purpose of the city as defined in ISO 37101.

14.1.2 Supporting indicator requirements

Square metres of public indoor recreation space per capita shall be calculated as the square metres of indoor public recreation space (numerator) divided by the population of the city (denominator). The result shall be expressed as square metres of indoor recreation space per capita.

NOTE The need for indoor public recreational spaces varies depending on local climatic and cultural conditions.

Public recreation space shall refer to land and buildings open to the public for relaxation, amusement or leisure pursuits. Recreation space shall include only space that primarily serves a recreation purpose.

Indoor public recreation space should include:

- a) city-owned or maintained buildings;

- b) other recreation buildings within the city not owned or operated by the city, provided they are open to the public. This category may include state or provincially owned buildings, schools and colleges, as well as non-profit organizations. If cities report only city-owned recreation space, this shall be noted.

For multi-story buildings the floor area of all floors in the building should be counted if known.

For multi-use facilities only the portion of the building devoted to recreation shall be counted (the play areas at a school or college, for example, not the entire school site).

The area of the entire recreation site shall be included (including, for example, building maintenance and utility areas) but shall exclude parking areas.

Many cities report city-owned recreation space and this does not include the contribution to recreation from non-city-owned facilities. This could be very important in developing countries. While the methodology in this document is more complex, the result will ultimately be more meaningful. It is recommended that a recreation space inventory be created.

14.1.3 Data sources

This information should be obtained from the city planning department together with departments knowledgeable about the city.

14.2 Square metres of public outdoor recreation space per capita (supporting indicator)

14.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Recreation is an important aspect of city life, contributing to the health of citizens and the vitality of the city. Recreation is a service that many cities provide through a parks and recreation department or related office. This will include outdoor recreation space.

NOTE 2 This indicator reflects the "Living & working environment" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Social cohesion" purpose of the city as defined in ISO 37101.

14.2.2 Supporting indicator requirements

Square metres of public outdoor recreation space per capita shall be calculated as square metres of outdoor public recreation space (numerator) divided by the population of the city (denominator). The result shall be expressed as square metres of outdoor recreation space per capita.

Public recreation space shall refer to land and open space available to the public for relaxation, amusement or leisure pursuits. Recreation space shall include only space that primarily serves a recreation purpose.

Outdoor recreation space should include:

- a) city-owned or maintained land;
- b) other-recreation lands within the city not owned or operated by the city, provided they are open to the public. This category may include state or provincially owned lands, school and college grounds, as well as non-profit organizations. If cities report only city-owned recreation space, this shall be noted.

For multi-use facilities, only the portion of the land devoted to recreation shall be counted (the play areas at a school or college, for example, not the entire school site). Double counting shall be avoided. For example, do not include indoor facilities on parkland.

The area of the entire outdoor recreation site shall be included (including, for example wooded areas of parks, building maintenance and utility areas) but shall exclude parking areas.

NOTE Many cities report city-owned recreation space and this does not include the contribution to recreation from non-city owned facilities. This could be very important in developing countries. While the methodology in this document is more complex, the result will ultimately be more meaningful. It is recommended that a recreation space inventory be created.

14.2.3 Data sources

Data should be obtained from a city planning department and/or departments responsible for recreation. Outdoor recreation spaces may be delineated using aerial photography and/or land use maps. Once the areas have been identified on a map, the area in square metres may be calculated using low-cost Geographic Information Systems (GIS) or, if not available, through use of hand-held measuring devices. Area may be calculated in hectares or acres and converted to square metres.

15 Safety

15.1 Number of firefighters per 100 000 population (core indicator)

15.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Fire response is one of the fundamental services that all cities provide in their role of protecting the lives and property of citizens.

NOTE 2 This indicator reflects the “Safety and security” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

15.1.2 Core indicator requirements

The number of firefighters per 100 000 population shall be calculated as the total number of certified and paid full-time-equivalent firefighters (numerator) divided by one 100 000th of the city population (denominator). The result shall be expressed as the number of firefighters per 100 000 population.

A firefighter shall refer to a certified full-time-equivalent staff member located in the fire suppression unit that regularly responds to daily calls, and shall not include staff from fire prevention, safety, training, administration, senior management not directly involved in fire suppression, communication or dispatch. Firefighters for company or plant fire brigades are also excluded, but military fire brigades are included.

This indicator is only intended to identify the number of paid certified firefighters engaged in fire suppression or directly related activities. This indicator shall not include volunteer firefighters and shall be reported as a separate indicator.

Firefighters per population alone is generally not sufficient to measure the adequacy of the city's fire response capabilities. The number of firefighters should be established based on the hazards and risk levels in any given city. Structures, geography, population density and past call volume reflect need and should be considered when establishing the number of firefighters in a community.

15.2 Number of fire-related deaths per 100 000 population (core indicator)

15.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 One of the many measures used to demonstrate the effectiveness of a city's fire services is the number of fire-related deaths that occur on an annual basis.

NOTE 2 This indicator reflects the "Safety and security" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" purpose of the city as defined in ISO 37101.

15.2.2 Core indicator requirements

The number of fire-related deaths per 100 000 population shall be calculated as the total number of citizen fire-related deaths recorded in a 12 month period (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of fire-related deaths per 100 000 population.

Fire-related deaths shall refer to deaths directly attributed to a fire incident, with death occurring within 30 days of the incident.

NOTE Some of the factors that can influence the rate of fatalities in a city include age and density of housing, fire prevention and education efforts, socio-demographics, enforcement of fire code and presence of working smoke detectors and alarm systems^[35].

15.2.3 Data sources

Insurance companies and fire departments in the city or in other levels of government are key providers of such data.

15.3 Number of natural-hazard-related deaths per 100 000 population (core indicator)

15.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The attractiveness of cities for citizens and investors alike is affected by the frequency and magnitude of natural hazards occurring within a city and a city's ability to respond. The natural-hazard-related losses of life in the past can be indicative of a city's potential future exposure.

NOTE 2 This indicator reflects the "Safety and security" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Resilience" purposes of the city as defined in ISO 37101.

15.3.2 Core indicator requirements

The number of natural-hazard-related deaths per 100 000 population shall be calculated as the total number of natural-hazard-related deaths recorded in a 12-month period (numerator) divided by one 100 000th of the city population (denominator). The result shall be expressed as the number of natural-hazard-related deaths per 100 000 population.

Natural-hazard-related deaths shall refer to deaths caused by disasters due to natural hazards.

NOTE As natural hazards are generally not restricted to the exact geographic confines of a city, content from related databases may need slight readjustment/recalculation to produce results matching a given city's defined geographic boundary.

15.3.3 Data sources

Insurance companies and disaster management agencies are key providers of such data.

15.3.4 Data interpretation

This indicator can be expanded beyond fatalities. Monetary losses can also be assessed as a result of natural hazards. These data are often available from insurance companies.

15.4 Number of police officers per 100 000 population (core indicator)

15.4.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The number of sworn-in police officers per 100 000 population is an indicator of the overall crime prevention in place in a city.

NOTE 2 This indicator reflects the "Safety and security" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" purpose of the city as defined in ISO 37101.

15.4.2 Core indicator requirements

The number of police officers per 100 000 population shall be calculated as the number of permanent full-time (or FTE) sworn-in police officers (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of police officers per 100 000 population.

Sworn-in police officers shall refer to law enforcement officers who meet the following criteria: work in an official capacity; have full arrest powers; carry identification; and are paid from governmental funds set aside specifically for payment of sworn-in law enforcement representatives. This is to include all federal, municipal and military police officers dedicated to the city area.

Each year, law enforcement agencies shall report the total number of sworn-in law enforcement officers as of a locally determined date. Personnel counts shall be based on permanent FTE. Part-time employees can be converted to FTEs (e.g. four employees working 10 h per week would equal one full-time employee working a 40 h week). Temporary officers shall not be included in this count.

15.4.3 Data sources

Data for this indicator should be gathered through police personnel information collected annually.

15.5 Number of homicides per 100 000 population (core indicator)

15.5.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The number of homicides is an indicator of the amount of crime and an indicator of feelings of personal safety, and can affect incentives to invest.

NOTE 2 This indicator reflects the "Safety and security" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Social Cohesion" purposes of the city as defined in ISO 37101.

15.5.2 Core indicator requirements

The number of homicides per 100 000 population shall be calculated as the number of reported homicides (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of homicides per 100 000 population.

Homicide shall refer to both intentional and non-intentional homicide. Intentional homicide shall refer to death deliberately inflicted on a person by another person, including infanticide. Non-intentional homicide shall refer to death non-deliberately inflicted on a person by another person.

This indicator shall include manslaughter, but shall exclude traffic accidents that result in the death of a person and suicides.

15.5.3 Data sources

The data should be obtained from the police department or other law enforcement agencies.

15.6 Number of volunteer and part-time firefighters per 100 000 population (supporting indicator)

15.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Firefighting is a basic service to protect property and human life in cities. Cities with populations of 100 000 or more usually have professional fire brigades with full-time employees. These are often supported by volunteer firefighters. In smaller cities and rural municipalities, fire brigades often consist mainly of volunteer workers.

NOTE 2 This indicator reflects the "Safety and security" and "Governance, empowerment and engagement" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Resilience" purpose of the city as defined in ISO 37101.

15.6.2 Supporting indicator requirements

The number of volunteer and part-time firefighters per 100 000 population shall be calculated as the total number of volunteer and part-time firefighters (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of volunteer and part-time firefighters per 100 000 population.

Volunteer firefighters shall refer to individuals who are not considered part-time or full time firefighters and normally respond to incidents without pay.

Part-time firefighters shall refer to individuals who are not considered full-time career firefighters and are paid only for incidents that they respond to.

15.7 Response time for emergency response services from initial call (supporting indicator)

15.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The response time (in minutes and seconds) it takes an emergency department to respond to an initial distress call is an indicator of how protected a city's residents are from security and safety threats. This indicator includes all emergency calls, for example those requiring rescue services and those prohibiting criminal acts.

NOTE 2 This indicator reflects the “Safety and security” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

15.7.2 Supporting indicator requirements

Response time for emergency response services from initial call shall be calculated as the sum of time elapsed from receiving the initial distress calls to the time of on-site arrival of the emergency personnel and equipment in minutes and seconds for the year (numerator) divided by the number of emergency responses in the same year (denominator). The result shall be expressed as the response time for emergency response services from initial call.

The total number of minutes and seconds taken to respond to all emergency response services calls shall include the time elapsed from receiving the initial call for assistance to arrival at the emergency site with properly trained personnel and equipment, and is calculated for the preceding 12 months. This indicator includes all forms of emergency response, for example rescue services and ambulatory rescue personnel, and police personnel responding to criminal acts such as robberies and assault.

NOTE Because an accurately recorded response time is objective, this indicator is a valuable key operational measure used to assess system performance from the citizen’s perspective.

15.8 Crimes against property per 100 000 population (supporting indicator)

15.8.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The number of property crimes is an indicator of the amount of criminal offences against privately-owned property and an indicator of feelings of personal safety and can affect incentives to invest. The number of property crimes in a city is considered a benchmark for the overall level of safety in the city. Because they have the appearance of objectivity, property crime statistics are a valuable key operational measure used to assess system performance concerning private space protection from the citizen’s perspective.

NOTE 2 This indicator reflects the “Safety and security” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “attractiveness” purpose of the city as defined in ISO 37101.

15.8.2 Supporting indicator requirements

The number of crimes against property per 100 000 population shall be calculated as the total number of all property crimes reported (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of property crimes per 100 000 population.

Crimes against property shall be defined as all offences involving the unlawful taking or destruction of property, but without the threat of use of force against a person.

Crimes against property include burglary, larceny-theft, motor vehicle theft and arson.

15.9 Number of deaths caused by industrial accidents per 100 000 population (supporting indicator)

15.9.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Industrial accidents can be an economic inhibitor and a detriment to public health.

NOTE 2 This indicator reflects the “Safety and security” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

15.9.2 Supporting indicator requirements

The number of deaths caused by industrial accidents per 100 000 population shall be calculated as the sum of deaths caused by industrial accidents in the last 12 months (numerator) divided by 100 000th of the city's population (denominator). The result shall be expressed as the number of deaths caused by industrial accidents per 100 000 population.

An industrial accident shall refer to a sudden and unforeseen event which occurs within an industrial work setting. It can range from isolated single accidents on site to large-scale industrial accidents which effect wider areas, such as large chemical spills, gas explosions and nuclear catastrophes.

Deaths caused by industrial accidents shall refer to those deaths occurring within 30 days of an industrial accident.

15.10 Number of violent crimes against women per 100 000 population (supporting indicator)

15.10.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Violence against women is a global phenomenon, occurring in every continent, country and culture. Violent crimes made against women are a grave violation of human rights, and their impact ranges from immediate to long-term multiple physical, sexual and mental consequences, including death, for women and girls. Such crimes negatively affect women's general well-being and prevent women from fully participating in society. Violent crimes not only have negative consequences for women but also their families, the community and the city at large. Violent crimes against women have tremendous costs, from greater healthcare and legal expenses and losses in productivity, impacting city budgets and overall development.

NOTE 2 This indicator reflects the "Safety and security" issue as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being," "Attractiveness," and "Social cohesion" purposes of the city as defined in ISO 37101.

15.10.2 Supporting indicator requirements

The number of violent crimes against women per 100 000 population shall be calculated as the total number of violent crimes against women (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of violent crimes against women per 100 000 population.

Women shall refer to people of all ages and who identify as female.

Violent crimes against women reported shall refer to the total sum of the number of murders (including "honour" killings) and non-negligent manslaughters, rapes and other sexual offences (e.g. female genital mutilation), incidents of domestic violence and aggravated assaults made against women.

Furthermore, a violent crime should be classified as one of the following four offences (in order of severity): murder and non-negligent manslaughter; rape and other sexual offences; domestic violence; and aggravated assault.

For a multiple offence, only the most serious/severe offence shall be counted.

NOTE The Declaration on the Elimination of Violence against Women adopted by the United Nations General Assembly in 1993 defines violence against women as any act of women-targeted, women-specific violence/violent crime that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women. Violence against women could include honour killings, rape, coercion or arbitrary deprivation of liberty, whether occurring in public or private life.

15.10.3 Data sources

Data on the number of violent crimes against women should be sourced from local public safety or police services, or relevant city departments or agencies that provide relevant services, including in the areas of health, criminal and civil justice, public housing, social services, refugees, advocacy and other support.

NOTE When interpreting this data, it should be noted that violence against women is often unreported and under-reported in many cities, and official registration of violent crimes against women can be under-representative.

16 Solid waste

16.1 Percentage of city population with regular solid waste collection (residential) (core indicator)

16.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the city population served by regular solid waste collection is an indicator of city health, cleanliness and quality of life. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment.

NOTE 2 This indicator reflects the “Community infrastructures” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

16.1.2 Core indicator requirements

The percentage of the city population with regular solid waste collection shall be calculated as the number of people within the city who are served by regular solid waste collection (numerator) divided by the total city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Regular solid waste collection shall be defined as having the solid waste picked up from the household, transported and dropped at a proper treatment facility (recycling or landfill sites) on at least a weekly basis or every two weeks. If the solid waste is collected in any moving vehicle by persons who have not constituted a legally established entity, the house shall not be considered as a household serviced with a solid waste collection service.

The number of households in the city serviced with regular solid waste collection shall first be determined. The number of households being serviced by the regular solid waste collection service shall then be multiplied by the current average household size for that city to determine the number of persons serviced with regular solid waste collection.

NOTE Use of persons rather than city area as the metric for this indicator avoids the distortion arising from local government areas that include both urban and non-urban areas.

16.1.3 Data sources

Information should be obtained from the local operator(s) of solid waste collection systems, census data and municipal waste facilities.

16.1.4 Data interpretation

Results will only indicate how much of the city population has access to solid waste collection systems, not the quality of the system, i.e. the quality of the service (street level), the levels of recycling (and

of landfill misuse) or the capacity of the landfill to meet the demand. Some of these issues will be addressed in the supporting indicators.

The proper discharge, transportation and treatment of solid waste is one of the most important components of life in a city and one of the first areas on which governments and institutions should focus. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment. A proper solid waste system can foster recycling practices that maximize the life cycle of landfills and create recycling micro-economies. It also provides alternative sources of energy that help reduce the consumption of electricity and/or petroleum-based fuels.

16.2 Total collected municipal solid waste per capita (core indicator)

16.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 This indicator provides a measure of how much waste a city is producing and the level of service a city is providing for its collection. Higher levels of municipal waste contribute to greater environmental problems and therefore levels of service of collection, and also methods of disposal, of municipal solid waste are an important component of municipal environmental management. Collection of municipal solid waste is also an indicator of city management with regard to cleanliness, health and quality of life. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” purpose of the city as defined in ISO 37101.

16.2.2 Core indicator requirements

The total collected municipal solid waste per capita shall be calculated as the total amount of solid waste (household and commercial) generated in tonnes (numerator) divided by the total city population (denominator). The result shall be expressed as total municipal solid waste collected per capita in tonnes.

Municipal waste shall refer to waste collected by or on behalf of municipalities.

The data shall only refer to the waste flows managed under the responsibility of the local administration, including waste collected on behalf of the local authority by private companies or regional associations founded for that purpose.

Municipal waste should include waste originating from:

- households;
- commerce and trade, small businesses, office buildings and institutions (e.g. schools, hospitals, government buildings).

The definition should also include:

- bulky waste (e.g. white goods, old furniture, mattresses);
- garden waste, leaves, grass clippings, street sweepings, the content of litter containers and market cleansing waste, if managed as waste;
- waste from selected municipal services, such as park and garden maintenance or street cleaning services (e.g. street sweepings, the content of litter containers, market cleansing waste), if managed as waste.

The definition shall exclude:

- waste from municipal sewage network and treatment;
- municipal construction and demolition waste.

16.2.3 Data interpretation

The proper discharge, transportation and treatment of solid waste is one of the most important components of life in a city and one of the first areas on which governments and institutions should focus. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment. A proper solid waste system can foster recycling practices that maximize the life cycle of landfills and create recycling micro-economies. It also provides alternative sources of energy that help reduce the consumption of electricity and/or petroleum-based fuels.

16.3 Percentage of the city's solid waste that is recycled (core indicator)

16.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Diverting recyclable materials from the waste stream is one strategy for addressing this municipal issue. Higher levels of municipal waste contribute to greater environmental problems and therefore levels of collection, and also methods of disposal, of municipal solid waste are an important component of municipal environmental management. Solid waste systems contribute in many ways to public health, the local economy, the environment, and the social understanding and education about the environment. A proper solid waste system can foster recycling practices that maximize the life cycle of landfills and create recycling micro-economies. It also provides alternative sources of energy that help reduce the consumption of electricity and/or petroleum-based fuels.

NOTE 2 This indicator reflects the “Community infrastructures” and “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

16.3.2 Core indicator requirements

The percentage of the city's solid waste that is recycled shall be calculated as the total amount of the city's solid waste that is recycled in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Recycled materials shall refer to those materials diverted from the waste stream, recovered and processed into new products following local government permits and regulations (International Solid Waste Association, ISWA[23]).

Hazardous waste that is produced in the city and is recycled shall be reported separately.

16.3.3 Data sources

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste.

Information on selected disposal methods should be gathered from municipal facilities and operators, and parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

16.4 Percentage of the city's solid waste that is disposed of in a sanitary landfill (core indicator)

16.4.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Open dumping and unsanitary landfills are sometimes the main disposal methods, particularly in lower-income cities. Sanitary landfills are the norm in only a limited number of cities worldwide.

NOTE 2 This indicator reflects the "Community infrastructures" and "Biodiversity and Ecosystem Services" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Preservation and improvement of environment" purposes of the city as defined in ISO 37101.

16.4.2 Core indicator requirements

The percentage of the city's solid waste that is disposed of in a sanitary landfill shall be calculated as the amount of the city's solid waste that is disposed of in a sanitary landfill in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Sanitary landfill shall refer to a carefully designed structure which uses a clay liner or a synthetic liner in order to isolate solid waste from the surrounding environment. This isolation is accomplished with a bottom liner and daily covering of soil.

16.4.3 Data sources

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste.

Information on selected disposal methods should be gathered from municipal facilities and operators, and parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

When data are not available, an estimate of the proportion of waste to sanitary landfill and the proportion disposed to open dump should be provided.

16.5 Percentage of the city's solid waste that is treated in energy-from-waste plants (core indicator)

16.5.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. As sanitary landfill sites are limited, cities examine more sustainable alternatives for disposal, such as energy-from-waste plants.

NOTE 2 This indicator reflects the "Community infrastructures" and "Biodiversity and Ecosystem Services" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Preservation and improvement of environment" purposes of the city as defined in ISO 37101.

16.5.2 Core indicator requirements

The percentage of the city's solid waste that is treated in energy-from-waste plants shall be calculated as the total amount of the city's solid waste that is disposed of in energy-from-waste plants in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

An energy-from-waste plant shall refer to a unit or facility used to generate electrical and/or heat energy from incinerated wastes. The facility should have a net energy efficiency higher than or equal to 0,25, meaning that the produced energy is higher than or equal to 25 % of incoming energy.

16.5.3 Data sources

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste.

Information on selected disposal methods should be gathered from municipal facilities and operators, parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

16.6 Percentage of the city's solid waste that is biologically treated and used as compost or biogas (supporting indicator)

16.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Biological treatments such as composting and anaerobic digestion are developing in many countries and offer an effective solution for biodegradable waste.

NOTE 2 This indicator reflects the "Community infrastructures" and "Biodiversity and Ecosystem Services" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Preservation and improvement of environment" purposes of the city as defined in ISO 37101.

16.6.2 Supporting indicator requirements

The percentage of the city's solid waste that is biologically treated and used as compost shall be calculated as the amount of the city's solid waste that is composted or anaerobically digested in tonnes minus the waste refuse of the composting and anaerobic digestion plants (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Composted or anaerobically digested waste shall refer to solid waste treated in authorized facilities dedicated to this purpose.

The quantity of solid waste that is composted or anaerobically digested is assessed at the entrance to the plants, but the quantity of refuse exiting the plants (metals, glass, other), which is recycled, disposed in energy-from-waste plants, or landfills, has to be excluded from this indicator (it is already considered in [16.3](#) to [16.8](#)).

Waste considered in this indicator corresponds to municipal solid waste as defined in indicator [16.2](#) (i.e. waste from the municipal sewage network and treatment is excluded).

16.6.3 Data sources

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste.

Information on selected disposal methods should be gathered from municipal facilities and operators, and parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

16.7 Percentage of the city's solid waste that is disposed of in an open dump (supporting indicator)

16.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem. Open dump as a disposal method remains an alternative for some cities facing budgetary limitations, particularly in lower-income cities.

NOTE 2 This indicator reflects the "Community infrastructures" and "Biodiversity and Ecosystem Services" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Well-being" and "Preservation and improvement of environment" purposes of the city as defined in ISO 37101.

16.7.2 Supporting indicator requirements

The percentage of the city's solid waste that is disposed of in an open dump shall be calculated as the amount of the city's solid waste that is disposed of in an open dump in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Open dump shall refer to an uncovered space or hole where solid waste is disposed of without further treatment.

16.7.3 Data sources

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste.

Information on selected disposal methods should be gathered from municipal facilities and operators, parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

When data are not available, an estimate of the proportion of waste to sanitary landfill and the proportion disposed to open dump shall be provided.

16.8 Percentage of the city's solid waste that is disposed of by other means (supporting indicator)

16.8.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Many cities generate more solid waste than they can dispose of. Even when municipal budgets are adequate for collection, the safe disposal of collected waste often remains a problem.

NOTE 2 This indicator reflects the “Community infrastructures” and “Biodiversity and Ecosystem Services” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

16.8.2 Supporting indicator requirements

The percentage of the city's solid waste that is disposed of by other means shall be calculated as the total amount of the city's solid waste that is disposed of by other means in tonnes (numerator) divided by the total amount of solid waste produced in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Other means shall refer to methods of disposal by means other than the ones indicated in 16.3 (recycling), 16.4 (sanitary landfill), 16.5 (energy-from-waste plants), 16.6 (biological treatment) and 16.7 (open dump). Other means include, for example, solid waste that is openly burned.

16.8.3 Data sources

This information should be obtained from municipal bodies, public services and major private contractors dealing with solid waste collection and disposal. Data may be obtained from specific studies carried out on solid waste.

Information on selected disposal methods should be gathered from municipal facilities and operators, and parastatal and private companies dealing with solid waste treatment. Solid waste experts, as well as NGOs working in this area, may be consulted.

16.9 Hazardous waste generation per capita (tonnes) (supporting indicator)

16.9.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The amount of hazardous waste generated is an indication of the risk to human health and the environment from hazardous substances. Hazardous waste impacts human health and degrades the environment. Hazardous waste might represent an immediate danger, such as burning skin on contact, or longer-term human health or environmental risks due to accumulation and persistence of toxics in the environment. Since many hazardous substances are persistent, breaking down very slowly in the environment, they build up in the air, water, food and soil. If disposed of without proper treatment, hazardous wastes can cause serious, long-lasting damage to both terrestrial and aquatic ecosystems. This could lead to habitat fragmentation and the disruption of ecosystem functioning, which in turn could lead to species loss and the decreased ability of ecosystems to support human livelihoods and commercial activities.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment” purpose of the city as defined in ISO 37101.

16.9.2 Supporting indicator requirements

Hazardous waste generation per capita shall be calculated as the annual total amount of hazardous waste in tonnes (numerator) divided by total city population (denominator). The result shall be expressed as total hazardous waste generated per capita in tonnes.

Hazardous waste shall refer to any substance intended for disposal, which can be harmful to people, plants, animals or the environment. Waste shall be defined as hazardous if it shows one or more of the following characteristics: toxicity, flammability, corrosivity or reactivity. They can be in any form – liquids, solids, gases (in containers) or sludge – and are produced by manufacturing processes, the chemical industry, the petroleum industry and other industrial sectors. Examples include acids, alkalis, solvents, medical waste, resins, hazardous sludges and heavy metals.

Hazardous wastes are those substances that require special technologically advanced methods of disposal to render them harmless or less dangerous to humans and the environment. Hazardous waste shall be treated, stored and disposed of properly at designated sites. Most hazardous wastes are eventually disposed of in landfills, surface impoundments (which eventually become landfills), land application units or by deep well injection.

Hazardous waste generated in the city includes hazardous waste collected under national or municipal hazardous waste directives or regulations, and in accordance with the city's monitoring and information systems. Hazardous waste is usually accepted at landfills, hazardous waste treatment facilities (including incinerators) and wastewater treatment facilities located in the boundaries of the city. This indicator also covers those hazardous wastes exported for disposal.

Normally the industrial sector is the biggest producer of hazardous waste and they are responsible for adequate disposal and recycling of their waste. However, private households also produce hazardous waste which should be collected separately for adequate disposal and recycling. The municipality should inform citizens of the negative impacts of this type of waste on the environment and encourage them to use the different collection methods (e.g. separate collection or dedicated collection points).

16.9.3 Data sources

This information should be obtained from municipal hazardous waste landfill sites, provincial or state authorities that regulate the operations of hazardous waste facilities or through survey data.

16.10 Percentage of the city's hazardous waste that is recycled (supporting indicator)

16.10.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Hazardous waste impacts human health and degrades the environment. Hazardous waste reuse, recycling and reclamation can:

- reduce risks to human health,
- avoid environmental hazards,
- conserve and protect scarce natural resources,
- provide economic benefits, and
- reduce reliance on raw materials and energy.

NOTE 2 This indicator reflects the "Economy and sustainable production and consumption" and "Community infrastructures" issues as defined in ISO 37101. It can allow an evaluation of the contribution to "preservation and improvement of environment" and the "Responsible resource use" purpose of the city as defined in ISO 37101.

16.10.2 Supporting indicator requirement

The percentage of the city's hazardous waste that is recycled shall be calculated as the total amount of hazardous waste that is recycled in tonnes (numerator) divided by the total amount of hazardous waste that is generated in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Recycled hazardous waste (or hazardous recyclables) shall refer to hazardous waste that is used, reused or reclaimed.

16.10.3 Data sources

This information should be obtained from municipal hazardous waste landfill sites, provincial or state authorities that regulate the operations of hazardous waste facilities or through survey data.

17 Sport and culture

17.1 Number of cultural institutions and sporting facilities per 100 000 population (core indicator)

17.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Cultural institutions and sporting facilities can provide an opportunity for citizens to develop, learn, and participate in their city to promote greater social cohesion. They can also boost local and regional economies by attracting businesses, workers and tourists.

NOTE 2 This indicator reflects the “Culture & community identity” and “Health and care” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social cohesion,” “Well-being” and “Attractiveness” purposes of the city as defined in ISO 37101.

17.1.2 Core indicator requirements

The number of cultural institutions and sporting facilities per 100 000 population shall be calculated as the total number of cultural institutions and sporting facilities in the city (numerator) divided by one 100 000th of the city’s population (denominator). The result shall be expressed as the number of cultural institutions and sporting facilities per 100 000 population.

Cultural institutions and sporting facilities shall refer to those institutions and facilities that are owned, managed or supported by local, state or national governments. Cultural institutions shall include museums, art galleries, live performance centres, libraries, botanical societies, historical societies and community cultural centres. Sporting facilities shall include indoor and outdoor facilities such as aquatic centres, sports fields, hard surface courts, and gymnasiums and fitness centres. This is not an exhaustive list; where possible, the types of institutions and facilities included should be indicated.

The number of cultural institutions and the number of sporting facilities shall be reported separately as per the following table. The two numbers will be summed to give the total number of cultural institutions and sporting facilities owned, managed or supported by local, state or national governments (numerator).

Number of cultural institutions	
Number of sporting facilities	

17.2 Percentage of municipal budget allocated to cultural and sporting facilities (supporting indicator)

17.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 A capital commitment to cultural and sporting facilities (leisure) can help ensure that venues are well maintained and remain attractive to regular and new visitors. This commitment is important for quality of life in the city and for citizens’ well-being.

NOTE 2 This indicator reflects the “Culture & community identity” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social cohesion,” “Well-being,” “Attractiveness” and “Responsible resource use” purposes of the city as defined in ISO 37101.

17.2.2 Supporting indicator requirements

The percentage of municipal budget allocated to cultural and sporting facilities shall be calculated as the total expenditures for cultural and sporting facilities (numerator) divided by the total gross operating budget (denominator). The result shall be multiplied by 100 and expressed as a percentage.

NOTE Cultural institutions and sport facilities are defined in [17.1.2](#).

Expenditures for culture and sport taken into account should cover:

- cultural institutions, which should include expenditure for buildings, materials, employees or other subsidies;
- maintenance of historic buildings, protection of sites;
- sports institutions, which should include expenditure for sporting facilities (buildings, materials, employees or other subsidies).

17.3 Annual number of cultural events per 100 000 population (e.g. exhibitions, festivals, concerts) (supporting indicator)

17.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Cultural events, like cultural institutions, provide venues for both social cohesion and social learning within cities. A city with a greater number of these events can be indicative of greater civic participation as well.

NOTE 2 This indicator reflects the “Culture & community identity” issue as defined in ISO 37101. It can allow an evaluation of the contribution to “Social cohesion”, “Well-being” and “Attractiveness” purposes of the city as defined in ISO 37101.

17.3.2 Supporting indicator requirements

The annual number of cultural events per 100 000 population shall be calculated as the total number of cultural events (numerator) divided by one 100 000th of the city’s population (denominator). The result shall be expressed as the annual number of cultural events per 100 000 population.

Cultural events shall include events such as exhibitions, festivals and concerts which are sponsored or operated under permit by the city. Cultural events occur locally and can be formal (e.g. theatre, dance or opera performance) or informal (e.g. community festivals and fairs)^[89].

NOTE This indicator does not reflect the broader cultural life of a city, but only that part of culture that is within the city’s purview.

18 Telecommunication

18.1 Number of internet connections per 100 000 population (supporting indicator)

18.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The number of internet connections is an indicator of information access and communication technology connectivity.

NOTE 2 This indicator reflects the “Community infrastructures” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Attractiveness” and “Social Cohesion” purpose of the city as defined in ISO 37101.

18.1.2 Supporting indicator requirements

The number of internet connections per 100 000 population shall be calculated as the number of internet connections in the city (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of internet connections per 100 000 population.

Internet connections shall refer to the number of internet subscriptions and not the number of people with internet access.

18.1.3 Data sources

Internet access records are kept by internet service and telecommunications providers in the form of subscriber locations and accounts. Other sources include government censuses, telecommunications records and official estimates.

18.2 Number of mobile phone connections per 100 000 population (supporting indicator)

18.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The number of mobile phone connections in a city’s population can reflect levels of telecommunication technology, information and communication technology, and innovation. Connectivity within a city, across regions and globally is a significant contributor to economic growth and development. This is also included under the Sustainable Development Goals^[22].

NOTE 2 This indicator reflects the “Community infrastructures” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Attractiveness” and “Social Cohesion” purpose of the city as defined in ISO 37101.

18.2.2 Supporting indicator requirements

The number of mobile phone connections per 100 000 population shall be calculated as the total number of mobile phone connections in the city (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of mobile phone connections per 100 000 population.

Individuals may have more than one mobile phone connection which shall be counted. Mobile phone connections shall refer to the number of mobile phone subscriptions and not the number of people with mobile phones.

18.2.3 Data sources

Mobile phone service records are kept by telecommunications providers in the form of subscriber locations and accounts. Other sources include government censuses, telecommunications records and official estimates.

19 Transportation

19.1 Kilometres of public transport system per 100 000 population (core indicator)

19.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The extent of a city's transportation network can provide insight into traffic congestion, transportation system flexibility and urban form. Cities with larger amounts of public transport might tend to be more geographically compact and supportive of non-motorized modes of transportation.

NOTE 2 This indicator reflects the "Community infrastructures" and "Mobility" issues as defined in ISO 37101. It can allow an evaluation of the contribution to the "Attractiveness", "Preservation and improvement of environment", "Well-being" and "Social Cohesion" purposes of the city as defined in ISO 37101.

19.1.2 Core indicator requirements

The kilometres of public transport system per 100 000 population shall be calculated as the total length (in kilometres) of the public transport systems operating within the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the kilometres of public transport system per 100 000 population.

Public transport shall include rail metro, subway systems, BRT (Bus Rapid Transit) systems, commuter rail systems, light rail, streetcars/tramways, buses, trolleybuses and other passenger transport services. If possible, data from each type of transport system should be included and listed individually. See [Table 3](#).

Transport systems that cover the same route shall be counted separately. For example, if a bus and streetcar cover the same 1-km route, this counts for 2 km.

Table 3 — Kilometres of public transport by system type

	Type of public transport system	Kilometres
High-capacity systems	Heavy rail metro	
	Subway	
	Commuter rail	
	Other	
	Total (high capacity)	
Low-capacity systems	Light rail	
	Streetcars/tramways	
	Buses and trolleybuses	
	BRT (Bus Rapid Transit)	
	Other	
	Total (low capacity)	
	TOTAL (all systems)	

19.1.3 Data sources

Information on kilometres of public transport should be gathered from municipal transport offices and local/regional transit authorities and can also be counted using computerized mapping, aerial photography or existing paper maps, all of which shall be field-verified. This information may be gathered from transport system plans or other master plans.

19.2 Annual number of public transport trips per capita (core indicator)

19.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Transport usage is a key indicator of how easy it is to travel in the city by modes other than single occupancy vehicles. The indicator might also provide insight into transportation policy, traffic congestion, accessibility and urban form. Cities with higher transport ridership rates tend to invest more in their transport systems and are more geographically compact. Transport usage also addresses overall travel patterns in the city, and not just the journey to work.

NOTE 2 This indicator reflects the “Mobility” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment”, “Responsible resource use” and “Well-being” purposes of the city as defined in ISO 37101.

19.2.2 Core indicator requirements

Annual number of public transport trips per capita shall be calculated as the total annual number of public transport trips originating in the city – “ridership of public transport” – (numerator) divided by the total city population (denominator). The result shall be expressed as the annual number of public transport trips per capita.

Public transport trips shall include trips via heavy rail metro or subway, commuter rail, light rail, streetcars and tramways, bus, trolleybus and other public transport services.

Cities shall only calculate the number of public transport trips with origins in the city itself.

NOTE Transport systems often serve entire metropolitan areas, and not just central cities. The use of number of public transport trips with origins in the city itself will capture many trips whose destination is outside the city, but will generally capture the impact that the city has on the regional transport network.

19.2.3 Data sources

Public transport data should be gathered from a number of sources including municipal transport authorities, official transport surveys, revenue collection systems (e.g. number of fares purchased) and national censuses.

NOTE 1 Farebox records (e.g. transport fares paid) are usually the primary source of data for this indicator. However, the relationship between fares purchased and trips taken is not always exact. For example, many public transport systems do not actively check for proof of fare purchase – often, riders are expected to have valid tickets, and are severely fined if a ticket is not presented, but enforcement of such rules is not uniform for every rider on every trip. Other public transport systems offer monthly or weekly passes, which do not necessarily allow for accurate counts of each trip.

In many countries, a large number of trips are made via “informal transport” services (e.g. minibuses not operated by the government or municipal transport corporation). These informal trips are not part of the official transport network and shall not be counted.

NOTE 2 While higher public transport ridership rates are generally considered desirable, extremely high ridership rates can also indicate cities with overcrowding problems.

19.3 Percentage of commuters using a travel mode to work other than a personal vehicle (supporting indicator)

19.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The mode of transportation used to commute to work is a key indicator of transportation policy, traffic congestion, urban form and energy use. Cities with lower personal vehicle usage tend to be more supportive of public transit and are more geographically compact. Lower use of single occupancy vehicles (SOV) is increasingly correlated with lower energy consumption and lower emissions of smog-producing chemicals.

NOTE 2 This indicator reflects the “Mobility” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment”, “Responsible resource use” and “Well-being” purposes of the city as defined in ISO 37101.

19.3.2 Supporting indicator requirements

Percentage of commuters using a travel mode to work other than a personal vehicle shall be calculated as the number of commuters working in the city who use a mode of transportation other than a private Single Occupancy Vehicle (SOV) as their primary way to travel to work (numerator) divided by all trips to work, regardless of mode (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Modes other than non-SOV shall include carpools, bus, minibus, train, tram, light rail, ferry, non-motorized two-wheel vehicles such as bicycles and walking.

NOTE This indicator includes commuters who work in the city, regardless of where they live. Even if these individuals do not live in the city, they use the transportation resources of the city, and therefore create impacts on the city's entire transportation system.

For cases where multiple modes are used, the indicator shall reflect the primary travel mode, either by length of trip with that mode or by distance travelled using that mode. For example, if a person drives a SOV from home to a suburban train station (5 min), takes a 30-min train ride to the central city, and then takes a 5-min bus ride to their office, the primary travel mode is the passenger train.

19.3.3 Data sources

The most likely sources of data for this indicator are travel surveys that collect trip frequency, trip duration and travel mode information from a statistically significant sample of a city's population. Such surveys are frequently performed at irregular intervals (primarily due to the cost and time associated with such an undertaking).

One common form of survey is a written travel log. Individuals or families use a log book or notebook to record information such as travel mode, time, distance and length of each trip.

This information is also frequently collected in general population censuses, which occur at regular intervals.

19.4 Kilometres of bicycle paths and lanes per 100 000 population (supporting indicator)

19.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 A transportation system that is conducive to cycling can reap many benefits in terms of reduced traffic congestion and improved quality of life. Economic rewards both to the individual and to society are also realized through reduced healthcare costs and reduced dependency on auto ownership (and the resulting insurance, maintenance and fuel costs). Bicycle lanes also require smaller infrastructure investments than other types of transportation infrastructure. Cycling has less of an environmental impact. This indicator provides cities with a useful measure of a diversified transportation system.

NOTE 2 This indicator reflects the “Mobility” and “Community infrastructures” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Preservation and improvement of environment”, “Responsible resource use” and “Well-being” purposes of the city as defined in ISO 37101.

19.4.2 Supporting indicator requirements

Kilometres of bicycle paths and lanes per 100 000 population shall be calculated as the total length (in kilometres) of bicycle paths and lanes (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the kilometres of bicycle paths and lanes per 100 000 population.

Bicycle lanes shall refer to part of a carriageway designated for cycles and distinguished from the rest of the road/carriageway by longitudinal road markings.

Bicycle paths shall refer to independent roads or parts of a road designated for cycles and signposted as such. A cycle track is separated from other roads or other parts of the same road by structural means.

Bicycle lanes or paths that exist on both sides of the same road shall be counted separately.

19.5 Transportation deaths per 100 000 population (supporting indicator)

19.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Traffic accident rates and, specifically, fatality rates, can serve as indicators for the overall safety of the transportation system, the complexity and congestion of the roadway and transport network, the amount and effectiveness of traffic law enforcement, the quality of the transportation fleet (public and private), and the condition of the roads themselves. Traffic deaths represent the most severe type of traffic safety failure, allowing cities to focus on their most urgent traffic safety needs.

NOTE 2 This indicator reflects the “Mobility”, “Health and care in the community”, “Community infrastructures” and “Safety and security” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

19.5.2 Supporting indicator requirements

Transportation deaths per 100 000 population shall be calculated as the number of deaths related to transportation of any kind within the city’s administrative boundary (numerator), divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as the number of transportation deaths per 100 000 population.

The city shall include in this indicator deaths due to any transportation-related proximate causes in any mode of travel (e.g. automobiles, trucks, public transport, bicycles, motorcycles, scooters, rickshaws).

The city shall count any death directly related to a transportation incident within city limits, even if death does not occur at the site of the incident but is directly attributable to the accident.

NOTE Transportation deaths are used here as a proxy for all transportation injuries. Whereas many minor injuries are never reported – and thus cannot be measured – deaths are almost always reported. It is also worth noting that differences in the quality of the roadway, the quality of motorized vehicles, and the nature of law enforcement can change the relationship between injury and fatality. Cities and countries might have different definitions of causality, specifically related to the amount of time that can elapse between a traffic incident and a death.

19.6 Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods (supporting indicator)

19.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Proximity to reliable and connected public transit provides the foundation for greater mode share, thus reducing congestion and other externalities. Greater transportation options also improve the liveability of cities.

NOTE 2 This indicator reflects the “Mobility”, “Living and working environment” and “Community infrastructures” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Attractiveness”, “Social cohesion” and “Well-being” purpose of the city as defined in ISO 37101.

19.6.2 Supporting indicator requirements

The percentage of the population living within 0,5 km of public transit running at least every 20 min during peak periods shall be calculated as the total number of inhabitants living within 0,5 km of public transit running at least every 20 min during peak periods (numerator) divided by the total city population (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Peak periods are the two periods in the day when traffic volume is highest. These two periods occur once in the morning and once in the evening. Peak periods will differ by region and municipality. Municipalities shall choose and maintain data on two 3-h periods.

19.6.3 Data sources

Cities reporting this indicator can consult public transit departments and authorities on frequency of service during peak periods.

GIS is a tool to support cities in mapping places of residence in proximity to public transit. For example, transit stops can be represented as a graphic layer to be included in the GIS, according to their location. The *georeferenced* population census can be obtained by a traditional relational database join process that relates inhabitants with their address in the georeferenced municipal street guide. The result will be a point layer in which each point represents one person's place of residence. Therefore, there would be as many points as there are inhabitants. Once both layers, transit stops and georeferenced population, are included in the GIS, proximity buffers of the transit stops can be created with the help of the GIS buffer geoprocess. Finally, the populations that live next to transit stops are those that are contained in the buffer layer, which can be obtained by a spatial selection.

19.7 Average commute time (supporting indicator)

19.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Commute times play an important role in the quality of life of working people, due to the negative effects of commuting on productivity and health (mental and physical).

NOTE 2 This indicator reflects the “Mobility” and “Community infrastructures” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Attractiveness”, “Social cohesion” and “Well-being” purpose of the city as defined in ISO 37101.

19.7.2 Supporting indicator requirements

The average commute time shall be calculated as the average time in hours and minutes that it takes a working person to travel from home to place of employment.

Average commute time shall be defined as a one-way commute (not round trip) and include only travel from home to place of employment.

19.7.3 Data sources

Data pertaining to average commute times can be sourced from departments or ministries responsible for transportation in the city or from census or survey data.

19.8 Transportation profile indicators

19.8.1 Number of personal automobiles per capita (profile indicator)

19.8.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE Measuring each type of transportation infrastructure sheds light on travel behaviour. The use of automobiles as a travel mode provides access to work, shopping, school and other community services. This measure can also inform the need for further transport facilities.

19.8.1.2 Profile indicator requirements

The total number of registered personal automobiles per capita shall be calculated as the total number of registered personal automobiles in a city (numerator) divided by the total city population (denominator). The result shall be expressed as the number of personal automobiles per capita.

The total number of registered personal automobiles shall refer to automobiles used for personal use and shall not include automobiles that are used for the delivery of goods and services by commercial enterprises. Automobiles that are electric powered shall be included.

19.8.2 Number of two-wheeled motorized vehicles per capita (profile indicator)

19.8.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE This indicator is important to cities that use two-wheeled motorized vehicles such as motorcycles and scooters as a major mode of transport.

19.8.2.2 Profile indicator requirements

The number of two-wheeled motorized vehicles per capita shall be calculated as the total number of two-wheeled motorized vehicles in the city (numerator) divided by the total city population (denominator). The result shall be expressed as the number of two-wheeled motorized vehicles per capita.

Two-wheeled motorized vehicles shall include scooters and motorcycles. This shall not include non-motorized vehicles such as bicycles.

20 Urban/local agriculture and food security

20.1 Total urban agricultural area per 100 000 population (core indicator)

20.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 As food security is becoming a global challenge, it is important that policies promote inclusion of areas devoted to urban agriculture and also plans of new urban development projects with the goal of producing food through reutilization of urban resources. Promotion of urban food systems is a high priority for sustainable development. Endorsement of urban agriculture falls under UN SDG Goal 2 by promotion of sustainable agriculture.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” and “Biodiversity and Ecosystem Services” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Resilience” and “Responsible resource use” and preservation and improvement of environment” purposes of the city as defined in ISO 37101.

20.1.2 Core indicator requirements

Total urban agricultural area per 100 000 population shall be calculated as the total designated urban agricultural area used for food production located within city boundaries (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the total urban agricultural area per 100 000 population.

The total urban agricultural area shall be calculated as the weighted sum of total areas designated to the agricultural types shown in [Table 4](#). All urban agricultural areas shall be located within city administrative boundaries.

Ratio of productivity, yield and carbon footprint: the calculation methodology is defined based on yield, carbon footprint of food produced, resource efficiency (water + nutrients + energy) and land efficiency. The total urban agricultural area shall be calculated using the weighing factors for the various agricultural area types ([Table 4](#)).

Table 4 — Weighting factors for various agricultural area types

Agricultural area type (within city boundary)	Weighting factor
Open-land farming and community-supported urban agriculture	1
Conventional greenhouses	10
Rooftop farms	10 × vertical farming ratio (if done in multiple levels)
Controlled-environment agriculture (including vertical farms and controlled-environment indoor farms)	50 × vertical farming ratio (if done in multiple levels)

Vertical farming ratio is an indicator of area and volume efficiency for a vertical farm, measuring the growing area compared with the ground footprint.

EXAMPLE If farming in layers triples the growing area compared with the ground footprint, then the vertical farming ratio is three.

20.2 Amount of food produced locally as a percentage of total food supplied to the city (supporting indicator)

20.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Promotion of local food systems is a high priority for sustainable development. Endorsement of local agriculture also falls under UN SDG Goal 12 by balancing sustainable food production and responsible consumption. Local agriculture could be a complementary key solution to food security issues, demanded urban resiliency and reutilization of local resources, and also a beneficiary factor to capitalize on the potential of existing urban infrastructure, waste streams and urban fabrics as resources for circular local economic and social growth.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Resilience” and “Responsible resource use” purposes of the city as defined in ISO 37101.

20.2.2 Supporting indicator requirements

The amount of food produced locally as a percentage of total food supplied to the city shall be calculated by the weight of locally produced food supplied to an urban area, in tonnes (numerator) divided by total food supplied to the city, in tonnes (denominator). The result shall be multiplied by 100 and expressed as a percentage.

NOTE 1 The local area refers to the area within a radius of 50 km around the city’s administrative boundaries.

NOTE 2 Total food supplied to the city refers to all food coming into the city, whether from within the country or from outside of the country, plus all food that is produced within the local area.

20.2.3 Data sources

Data such as the origin of the food product can be collected from major suppliers and distribution hubs.

20.3 Percentage of city population undernourished (supporting indicator)

20.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Food availability, stability, accessibility and affordability are prerequisites for a healthy society and its sustainable development. SDG Goal 2 aims to end hunger, achieve food security and improved nutrition and promote sustainable agriculture.

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

20.3.2 Supporting indicator requirements

The percentage of the city population undernourished shall be calculated as the total number of the city population undernourished (numerator) divided by the total population of the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

NOTE Undernourishment is defined by the World Health Organization (WHO) as a form a malnourishment. Undernourishment includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals) (<http://www.who.int/features/qa/malnutrition/en/>).

20.3.3 Data sources

Data on undernourishment may be aggregated from WHO statistics on nutrition [<http://www.who.int/nutrition/nlis/en/>], local non-governmental or non-profit groups, or national state health departments.

20.4 Percentage of city population that is overweight or obese — Body Mass Index (BMI) (supporting indicator)

20.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Obesity is a risk factor for many chronic illnesses, particularly heart disease and diabetes. Although a variety of factors contribute to obesity, physical activity and dietary practices help prevent this obesity. The health consequences of excess weight include increased risk of physical chronic conditions and psychosocial problems. Promotion of healthy dietary practices falls under UN SDG 12 by balancing sustainable food production and responsible consumption.

NOTE 2 This indicator reflects the “Health and care in the community” issue as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” purpose of the city as defined in ISO 37101.

20.4.2 Supporting indicator requirements

Percentage of the city population that is overweight or obese shall be calculated as the total number of the city population that is overweight or obese (numerator) divided by the total population of the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Overweight or obese persons shall refer to those persons having a Body Mass Index (BMI) in the “overweight” (low risk or high risk) or “obese” (class I, II, or III) categories defined by the World Health Organization (WHO) (Table 5). BMI is a method of classifying body weight according to health risk. It is determined for the population based on age categories, and is calculated as weight in kilograms divided by height in metres squared.

Table 5 — Body Mass Index (BMI) limits by age and sex

	Under-weight	Normal weight	Overweight	Obese class I, High risk	Obese class II, Very high risk	Obese class III, Extremely high risk
Adults > 19 years	< 18,5	18,5–24,9	25–29,9	30–34,9	35–39,9	> 40

		Under-weight high risk	Under-weight low risk	Normal weight	Overweight low risk	Overweight high risk
Girls	5–6 years	< 13	14	15,5	17	> 18,5
	7–8 years	< 13	14,5	15,5–16	18	> 19–20
	9 years	< 13,5	14,5	16	18,5	> 21
	10 years	< 13,5	14,5	16,5	19	> 22
	11 years	< 14	15	17	20	> 23
	12 years	< 14,5	16	18	21	> 24
	13 years	< 15	16,5	18,5	22	> 25
	14 years	< 15,5	17	19	22,5	> 26,5
	15 years	< 16	17	20	23	> 27
	16 years	< 16,5	18	20,5	24	> 28
	17 years	< 16,5	18,5	21	24,5	> 29
	18 years	< 17	18,5	21	24,5	> 29
	19 years	< 17	18,5	21,5	24,5	> 29

		Under-weight high risk	Under-weight low risk	Normal weight	Overweight low risk	Overweight high risk
Boys	5–6 years	< 13,5	14	15,5	17	> 18,5
	7–8 years	< 13	14,5	15,5–16	18	> 19–20
	9 years	< 13,5	14,5	16	18	> 20
	10 years	< 13,5	14,5	16,5	18,5	> 21
	11 years	< 14,5	15	16,5	19	> 22
	12 years	< 14,5	15,5	17	21	> 24
	13 years	< 15	16,5	18,5	21	> 24,4
	14 years	< 16	17	19	22	> 25,5
	15 years	< 16	17,5	20	22,5	> 26,5
	16 years	< 16,5	18	20,5	24	> 27,5
	17 years	< 17	19	21	24,5	> 28
	18 years	< 17,5	19	21,5	25	> 28,5
	19 years	< 18	19,5	22	25,5	> 29

NOTE For adults, this table excludes pregnant women and people shorter than three feet (0,914 m) or taller than six feet 11 inches (2,108 m). BMI for children under the age of five is subject to many complications. Data gathering at city level is recommended.

WHO methodology:

http://www.who.int/growthref/cht_bmifa_boys_perc_5_19years.pdf?ua=1

http://www.who.int/growthref/cht_bmifa_girls_perc_5_19years.pdf?ua=1

21 Urban planning

21.1 Green area (hectares) per 100 000 population (core indicator)

21.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The amount of vegetated and/or natural surface cover is an indicator of how much “green” space a city has. Green or natural spaces perform important environmental functions in an urban setting. They improve the urban climate, capture atmospheric pollutants, reduce storm runoff and improve quality of life by providing recreation for urban inhabitants.

NOTE 2 This indicator reflects the “Biodiversity and Ecosystem Services” and “Living & working environment” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Attractiveness”, “Preservation and improvement of environment” and “Well-being” purpose of the city as defined in ISO 37101.

21.1.2 Core indicator requirements

Green area (hectares) per 100 000 population shall be calculated as the total area (in hectares) of green in the city (numerator) divided by one 100 000th of the city’s total population (denominator). The result shall be expressed as green area (hectares) per 100 000 population.

Green areas refer to the amount of vegetated and/or natural surface cover in the city. Green or natural spaces areas should also include green roofs. Green area is broader than recreation space, and should include both public and private spaces. Areas that are without green or natural surface cover are assumed to be sealed (i.e. paved or impervious).

21.1.3 Data sources

Information on green area should be obtained from municipal recreation and parks departments, planning departments, forestry departments and census. Green areas can be delineated using aerial photography and/or land use/land cover maps.

21.2 Areal size of informal settlements as a percentage of city area (supporting indicator)

21.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Settlements characterized by irregular tenure, unplanned development and unauthorized shelter that is not in compliance with local building codes and regulations are generally marginal and precarious, and affect social well-being, human health and economic development. The size of informal settlements is an indicator of the extent of the challenges for the reporting city in meeting shelter needs and demand.

NOTE 2 This indicator reflects the “Living together, interdependence and mutuality” and “Living & working environment” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Social Cohesion” “Resilience” and “Well-being” purpose of the city as defined in ISO 37101.

21.2.2 Supporting indicator requirements

The areal size of informal settlements as a percentage of city area shall be calculated as the area of informal settlements within the city boundary (in square kilometres) (numerator) divided by the city area in square kilometres (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

To simplify the measure of informal settlements, those smaller than 2 km² should not be included.

Informal settlements are known by many different names around the world including shantytowns, favelas (Brazil), squatter camps (South Africa) and bidonvilles in French-speaking areas. The UN Statistics Division has developed the following definitions which are used in this document:

- a) Areas where groups of housing units have been constructed on land that the occupants have no formal legal claim to.
- b) Unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing)^[17].

NOTE While many informal settlements also meet the definition of slum, the terms are not synonymous. Slums might exist in areas that do not meet the definition of informal settlements. Some informal settlements might have improved such that they do not meet the definition of slum.

Areas of informal settlements should be delineated using aerial photography and/or land-use maps and the area in square kilometres shall be calculated. Some low-cost and more sophisticated measurement methodologies have been developed. Once the areas have been identified on a map, the area in square kilometres should be calculated using a low-cost GIS (if available) or measuring devices.

21.2.3 Data sources

Data should be gathered from the city planning department, together with departments knowledgeable about the city neighbourhoods. Local academic institutions may also be of assistance.

21.3 Jobs–housing ratio (supporting indicator)

21.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 A well-planned city focuses on the implications of new growth on its economy, existing communities and the environment. Growth is concentrated in areas that can accommodate a mix of housing, commerce, industry and recreation to maximize the use of existing infrastructure, minimize travel times to and from work, and minimize servicing costs resulting from new growth. Encouraging mixed-use developments combining housing and employment opportunities is essential to achieve these objectives.

NOTE 2 This indicator reflects the “Living together, interdependence and mutuality” and “Mobility” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being”, “Attractiveness” and “Resilience” purposes of the city as defined in ISO 37101.

21.3.2 Supporting indicator requirements

The jobs–housing ratio shall be calculated as the total number of jobs (numerator) divided by the total number of dwelling units (denominator). The result shall be expressed as a whole number reflecting jobs to housing ratio within a city.

Jobs shall refer to all types of full- and part-time employment opportunities including those provided in the retail, industrial, government and office sectors located within the city boundaries. Housing shall refer to all dwelling units available for habitation.

This indicator does not take into account the informal sector, labour or employment, as unofficial employment is unaccounted for.

21.4 Basic service proximity (supporting indicator)

21.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The ease with which residents are able to access basic services is an important indicator of overall liveability and quality of life. This indicator measures the percentage of the population that lives within established proximity to basic services.

NOTE 2 This indicator reflects the “Living together, interdependence and mutuality” and “Mobility” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being”, “Attractiveness” and “Resilience” purposes of the city as defined in ISO 37101.

21.4.2 Supporting indicator requirements

Basic service proximity shall be calculated as the number of inhabitants who live near at least one basic service (numerator) divided by the total population of the city (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Table 6 — Distances to be considered for basic service types

Basic services		Distance to be considered
Food and everyday products	Basic food product supply	300 m
	Market supply	500 m
Public or private education centres	Nursery school	300 m
	Primary school	300 m
	Secondary school	500 m
Public or private health centres	Healthcare centres	500 m
	Hospitals	1 000 m
Social centres	Community social services centres and senior citizens day centres	500 m
Sports centres	Public usage sports facilities	500 m
Cultural centres	Public libraries, museums and other cultural centres	500 m
Entertainment centres	Cinemas, theatres and other leisure centres	500 m
Selective waste collection points	Places for selective waste collection (organic, paper, glass and packaging)	100 m
Green area	Public park	400 m

Source: <http://www.catmed.eu/dic/en/61/proximity-to-basic-services>

For each type of basic service, the corresponding point layer is created by georeferencing the centres using a relational database join process that relates each centre with its address in the georeferenced municipal street guide.

Once all the layers are included in the GIS, proximity buffers are created for each of them with the help of the GIS buffer geoprocess. See [Table 6](#).

Finally, the population that lives close to the basic service centres are those that are contained in each buffer layer, which can be obtained by a spatial selection.

NOTE 1 The methodology provided is based on CAT-MED.

NOTE 2 Some services might be accessible by public transport.

21.5 Urban planning profile indicators

21.5.1 Population density (per square kilometre) (profile indicator)

21.5.1.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE If density is designed well, it can be viewed as a community asset as it increases the proximity between residents and local goods and services. Population density is one metric that can be used to help determine this.

21.5.1.2 Profile indicator requirements

Population density shall be calculated as the total city population (numerator) divided by the city's land area. The result shall be expressed as number of persons per square kilometre.

21.5.2 Number of trees per 100 000 population (profile indicator)

21.5.2.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE The number of trees per 100 000 population is a useful measure of a city's commitment to urban and environmental sustainability, as well as municipal beautification. Trees are often cited as an important landscape feature to reduce the impacts of climate change due to their role in removing carbon dioxide from the Earth's atmosphere.

21.5.2.2 Profile indicator requirement

The number of trees per 100 000 population shall be calculated as the total number of trees in the city (numerator) divided by one 100 000th of the city's total population (denominator). The result shall be expressed as the number of trees per 100 000 population.

The number of trees shall refer to the total stock of all living trees in the city. Tree counts are normally performed with satellite imagery, aerial photography, and/or ground-based surveys.

21.5.2.3 Data sources

Estimates of tree stock can be obtained from municipal government records, tree censuses, municipal departments of forestry, and other related planning or environmental departments of the city.

21.5.3 Built-up density (profile indicator)

21.5.3.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

21.5.3.2 Profile indicator requirements

Built-up density shall be calculated as the total floor area in square metres (for all buildings) (numerator) divided by (total city area in square metres subtracted by green space area in square metres).

Floor area can be calculated as ground area multiplied by the number of floors.

This represents "perceived" density and considers multifunctional area.

22 Wastewater

22.1 Percentage of city population served by wastewater collection (core indicator)

22.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the city population served by a wastewater collection is an indicator of city health, cleanliness and quality of life. Wastewater collection and treatment is a significant component of the Sustainable Development Goals, Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All [22].

NOTE 2 This indicator reflects the “Living & working environment” and “Community infrastructure” and “Health and care in community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

22.1.2 Core indicator requirements

Percentage of city population served by wastewater collection shall be calculated as the number of people within the city who are served by wastewater collection (numerator) divided by the city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The number of households in the city serviced with wastewater collection shall first be determined by counting the number of households that are connected as part of a public or community-owned system of discharge of served waters and other residues through a pipe or similar duct connected to a network that takes it to a facility where it is treated. The number of households being serviced by wastewater connection shall then be multiplied by the then current average household size for that city to determine the number of persons serviced with wastewater collection.

NOTE Results will only indicate whether or not a house has access to wastewater systems, not the quality of the system, the capacity and quality of the service, the levels of loss (contamination) or the capacity of the treatment plants to meet the growth in wastewater volumes. Some of these limitations will be addressed in other supporting indicators.

22.1.3 Data sources

Information on the number of households in the city serviced with regular wastewater collection should be obtained from the local operator(s) of wastewater systems.

22.2 Percentage of city's wastewater receiving centralized treatment (core indicator)

22.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of wastewater treated is a key indicator of water quality management. It has been proven that improvement of water treatment reduces the incidence of a variety of water-borne diseases. A reliable wastewater treatment system is a major indicator of the level of local development and of community health. Water pollution from human waste is less of a problem in countries that can afford to treat sewage and wastewater, and water pollution can be minimized with adequate investment in treatment systems.

NOTE 2 This indicator reflects the “Community infrastructure” issues as defined in ISO 37101 and “living and working environment”. It can allow an evaluation of the contribution to the “Well-being” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

22.2.2 Core indicator requirements

The percentage of city wastewater receiving centralized treatment shall be calculated as the total volume of city wastewater collected for primary, secondary and tertiary treatment in centralized wastewater treatment facilities (numerator) divided by the total volume of wastewater produced in the city (denominator). This result is then multiplied by 100 and expressed as a percentage.

Primary wastewater treatment shall refer to the physical separation of suspended solids from the wastewater flow using primary clarifiers. This separation reduces total suspended solids as well as the biological oxygen demand (BOD) levels and prepares the waste stream for the next step in the wastewater treatment process.

Secondary treatment shall refer to the process of removing or reducing contaminants or growths that are left in the wastewater from the primary treatment process. Secondary treatment reduces biological oxygen demand (BOD) by microbial oxidation.

Tertiary treatment shall refer to the next wastewater treatment process after secondary treatment. This step removes stubborn contaminants that secondary treatment was not able to clean up. Wastewater effluent becomes even cleaner in this treatment process through the use of stronger and more advanced treatment systems. Tertiary treatment technologies can be extensions of conventional secondary biological treatment to reduce BOD levels and further stabilize oxygen-demanding substances in the wastewater and to remove nitrogen and phosphorus. Tertiary treatment may also involve physical-chemical separation techniques such as carbon adsorption, flocculation/precipitation, membranes for advanced filtration, ion exchange, chlorination, dechlorination and reverse osmosis.

Some cities have no system for treating wastewater. This shall be reported.

NOTE BOD is the amount of dissolved oxygen required to oxidize or neutralize biodegradable matter in water. High BOD levels represent high amounts of contaminant matter, and the reduction of BOD is a common measure for determining the efficacy of water treatment.

The individual values for primary, secondary and tertiary treatment shall be reported in [Table 7](#).

Table 7 — Percentage of city wastewater receiving primary, secondary, and tertiary treatment

(1) % of city wastewater volume receiving primary treatment/total volume of wastewater produced in the city and collected	(2) % of city wastewater volume receiving secondary treatment/total volume of wastewater produced in the city and collected	(3) % of city wastewater volume receiving tertiary treatment/total volume of wastewater produced in the city and collected	Total (1 + 2 + 3): % of wastewater volume receiving wastewater treatment/total volume of wastewater produced in the city and collected

22.2.3 Data sources

This information may be obtained from municipal authorities and the main water supply and treatment companies.

22.3 Percentage of population with access to improved sanitation (core indicator)

22.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Access to improved sanitation is a fundamental need, vital for the dignity and health of all people. About 2,6 billion people lack even a simple “improved” latrine. Furthermore, 1,6 million people die every year from diarrhoeal diseases attributable to lack of safe drinking water and basic sanitation.

NOTE 2 This indicator reflects the “Community infrastructure” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Resilience” purposes of the city as defined in ISO 37101.

22.3.2 Core indicator requirements

The percentage of the population with access to improved sanitation shall be calculated as the total number of people using improved sanitation facilities (numerator) divided by the total city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Access to improved sanitation facilities shall refer to the percentage of the city population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal and insect contact with excreta. Improved facilities range from simple, protected pit latrines to flush toilets with a sewerage connection to a collective wastewater network. To be effective, facilities have to be correctly constructed and properly maintained.

Improved sanitation facilities shall include

- flush or pour-flush to piped sewer system, septic tank or pit latrine,
- ventilated improved pit latrine,
- pit latrine with slab, and
- composting toilet.

NOTE 1 Sanitation facilities are not considered improved when shared with other households or open to public use.

Unimproved sanitation shall include

- flush or pour-flush to elsewhere,
- pit latrine without slab or open pit,
- bucket, hanging toilet or hanging latrine, and
- no facilities or bush or field (open defecation).

NOTE 2 The percentage of the city population using wastewater on-site disposal systems can be deduced from indicators [22.4](#) and [22.1](#)

22.4 Compliance rate of wastewater treatment (supporting indicator)

22.4.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE This indicator reflects the “Community infrastructure” and “Biodiversity and Ecosystem Services” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Preservation and improvement of environment” purposes of the city as defined in ISO 37101.

22.4.2 Supporting indicator requirements

Compliance rate of wastewater treatment shall be calculated as the number of compliant tests required by local regulation multiplied by 100 (numerator) divided by the number of tests performed as required by local regulation (denominator). The result shall be expressed as a percentage.

The compliance rate of wastewater treatment is expressed as a percentage of the total number of treated wastewater tests performed that comply with the local effluent discharge regulation and standards applicable to the wastewater treatment facilities where the city treats its wastewaters. The tests to

be taken into account are the tests performed on the water discharged to the natural environment for each parameter in relation with the local regulation (e.g. BOD5, DCO, SS).

This indicator should be assessed on an annual basis.

23 Water

23.1 Percentage of city population with potable water supply service (core indicator)

23.1.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 The percentage of the city population served by a potable water supply is an indicator of city health and quality of life and a significant component of the Sustainable Development Goals, Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All[22].

NOTE 2 This indicator reflects the “Community infrastructure” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Resilience” purposes of the city as defined in ISO 37101.

23.1.2 Core indicator requirements

The percentage of the city population with potable water supply service shall be calculated as the total number of people with potable water supply service (numerator) divided by total city population (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Potable water shall refer to drinkable water that has been treated and is confirmed safe for human consumption. A potable water supply service shall refer to a service that delivers potable water through a pipe or similar duct that is connected to a network. If a house or group of houses has a “mother” pipe connected either provisionally or permanently, it shall be considered to have access to potable water.

The total number of people with potable water supply service shall be calculated as the total number of households in the city connected to a potable water supply service multiplied by the current average household size for the city.

NOTE Results will only indicate whether or not a house has access to potable water, not the quality of the delivery, the levels of loss, consumption or misuse or the capacity of the sources to meet the demand.

A house shall not be considered to have access to potable water when an individual house or group is served by a conduit system built with, for example, wood, bamboo or rubber hose, connected directly to a river, well or another house.

23.1.3 Data sources

Information should be obtained from the local operator(s) of water supply systems.

23.2 Percentage of city population with sustainable access to an improved water source (core indicator)

23.2.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Access to drinking water is a fundamental need and a human right vital for the health of all people. About 1,1 billion people have no access to any type of improved source of drinking water. 1,6 million people die every year from diarrhoeal diseases attributable to lack of safe drinking water and basic sanitation. The health and economic benefits of improved water supply to households and individuals are well documented^[12].

NOTE 2 This indicator reflects the “Community infrastructure” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Resilience” purposes of the city as defined in ISO 37101.

23.2.2 Core indicator requirements

The percentage of the city population with sustainable access to an improved water source shall be calculated as the total population with access to an improved water source (numerator) divided by the total city population. The result shall then be multiplied by 100 and expressed as a percentage.

An improved water source shall refer to piped water, public tap, borehole or pump, protected well, protected spring or rainwater.

The percentage of the city population with sustainable access to an improved water source represents the percentage of the population with reasonable access to an adequate supply of safe water in their dwelling or within a convenient distance of their dwelling. Reasonable access to water is defined as the availability of at least 20 l of water per person a day from a source within 1 km of the dwelling (World Health Organization/UNICEF, *Global Water Supply and Sanitation Assessment 2000 Report*).

23.3 Total domestic water consumption per capita (litres/day) (core indicator)

23.3.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Water consumption must be in harmony with water resources to be sustainable. This harmony can be achieved through improvements in water supply systems and changes in water consumption patterns. Consumption of water per person depends on the availability and price of water, the climate and the uses to which water is customarily put by individuals (e.g. drinking, bathing, washing, gardening). In many cities, the potable water supply is not constant and households rely on a few hours a day to tap the available water. Water consumption is usually much higher in cities of higher-income countries.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” purpose of the city as defined in ISO 37101.

23.3.2 Core indicator requirements

The total domestic water consumption per capita (litres/day) shall be calculated as the total amount of the city's water consumption for domestic use (numerator) divided by the total city population (denominator). The result shall be expressed as the total domestic water consumption per capita in litres/day.

Only water consumed for domestic purposes shall be taken into account. Water consumed for industrial and commercial purposes shall be excluded.

Domestic water use is a small portion of total water consumption, trailing agricultural and industrial uses. Before reaching the users, a part of the water supplied might be lost through leakage or illegal tapping. In cities with old and deteriorating water reticulation systems, a substantial proportion of piped water may be lost through cracks and flaws in pipes. It is therefore important to take this into account in the final consumption measure and, if possible, not to take the actual supply as the final consumption figure.

23.3.3 Data sources

This information should be obtained from the main water supply companies, which maintain records on water supplied, delivered, consumed and ultimately paid for by the end-users for domestic purposes.

23.3.4 Data interpretation

In interpreting this indicator, water consumption per capita should fall within a range that is sustainable for the climate of the city. A minimum benchmark should be established to meet public health and safety needs. Higher rates of per-capita water consumption should show reductions approaching the minimum or sustainable consumption rates.

NOTE Water consumption rates might temporarily spike with income as new appliances are purchased and until water prices increase, encouraging water-saving appliances to enter the market.

23.4 Compliance rate of drinking water quality (core indicator)

23.4.1 General

Those implementing this document shall report on this indicator in accordance with the following requirements.

NOTE 1 Clean drinking water is a key determinant of human health. The compliance rate of drinking water quality is an indicator which can be used to determine the rate at which drinking water is kept to local regulations and standards to ensure no public health problems.

NOTE 2 This indicator reflects the “Community infrastructure” and “Health and care in the community” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Well-being” and “Resilience” and “Attractiveness” purposes of the city as defined in ISO 37101.

23.4.2 Core indicator requirements

Compliance rate of drinking water quality shall be calculated as the sum of the number of compliant tests multiplied by 100 (numerator) divided by the number of treated water quality tests carried out (denominator). The result shall be expressed as a percentage.

Compliant tests to be considered are aesthetic, microbiological, physical, chemical and radioactivity tests.

The compliance rate of drinking water quality indicates the percentage of the total number of treated water tests performed that comply with the applicable drinking water local regulations and standards on an annual basis. The tests to be taken into account are the analyses performed on the distributed water for each parameter in relation with the local regulation (e.g. E. coli, lead, arsenic). This can include the level of contaminants present such as microbiologicals, turbidity, disinfectant residuals, trihalomethanes, haloacetic acids and inorganic chemicals.

NOTE Adapted from ISO 24510:2007[90] and ISO 24512:2007[91].

This indicator should be assessed on an annual basis.

23.5 Total water consumption per capita (litres/day) (supporting indicator)

23.5.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Water consumption must be in harmony with water resources to be sustainable. This harmony can be achieved through improvements in water supply systems and changes in water consumption patterns. Consumption of water per person depends on the availability and price of water, the climate and the uses to which water is customarily put by individuals (e.g. drinking, bathing, washing, gardening) and industrial, commercial and agricultural entities. In many cities, the potable water supply is not constant and households rely on a few hours a day to tap the available water. Water consumption is much higher in cities of higher-income countries, as with most other forms of consumption.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” purpose of the city as defined in ISO 37101.

23.5.2 Supporting indicator requirements

Total water consumption per capita (litres/day) shall be calculated as the total amount of the city's water consumption in litres per day (numerator) divided by the total city population (denominator). The result shall be expressed as the total water consumption per capita in litres/day.

23.5.3 Data sources

This information should be obtained from the main water supply companies, which maintain records on water supplied, delivered, consumed and ultimately paid for by the end users.

23.6 Average annual hours of water service interruptions per household (supporting indicator)

23.6.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 The reliability of water service to the user is the ultimate consideration in evaluating water supply, even though this reliability is based on both quantity and quality considerations and on interconnected systems of source water availability, water treatment and water distribution. This indicator determines whether a water supply system is reliable, or whether the water supply system needs fundamental or marginal improvements.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” and “Well-being” and “Attractiveness” purposes of the city as defined in ISO 37101.

23.6.2 Supporting indicator requirements

The average annual hours of water service interruptions per household shall be calculated as the total sum of hours of interruption multiplied by the number of households impacted (numerator) divided by the total number of households (denominator). The result shall be expressed as the average annual hours of water service interruption per household.

Water service interruptions shall refer to incidents of complete shutoff, low flow restriction, boil water advisory and water main flushing, and shall include both “planned” interruptions (for which the utility has provided at least 24 h advanced notifications, or as otherwise prescribed by regulatory requirements) and “unplanned” interruptions (caused by a fault in the utility's system).

This indicator shall exclude:

- incidents where there is some reduction to the level of service but where normal activities (e.g. shower, washing machine, toilet flushing) are still possible, and
- interruptions due to breakage of house-connection lines.

23.6.3 Data interpretation

Cities with older infrastructure, in areas of war or civil unrest, or in areas that are more susceptible to natural hazards such as earthquakes and extensive flooding, will tend to report more incidents of service interruptions.

To facilitate comparison among cities, the number of interruptions can also be related to the hectares of water service area within the city.

23.7 Percentage of water loss (unaccounted for water) (supporting indicator)

23.7.1 General

Those implementing this document should report on this indicator in accordance with the following requirements.

NOTE 1 Before reaching the users, a part of the water supplied might be lost through leakage or illegal tapping. In cities with old and deteriorating water reticulation systems, a substantial proportion of piped water might be lost through cracks and flaws in pipes — for example up to 30 % of water is lost in this way in some countries in Eastern Europe.

NOTE 2 This indicator reflects the “Economy and sustainable production and consumption” issues as defined in ISO 37101. It can allow an evaluation of the contribution to the “Responsible resource use” purpose of the city as defined in ISO 37101.

23.7.2 Supporting indicator requirements

The percentage of water loss (unaccounted for water) shall be calculated as the volume of water supplied minus the volume of utilized water (numerator) divided by the total volume of water supplied (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The percentage of water loss (unaccounted for water) represents the percentage of water that is lost from treated water entering distribution system and that is not accounted for and billed by the water provider. This includes actual water losses, for example due to leaking pipes, and billing losses, for example due to an informal or illegal connection.

23.7.3 Data sources

Data should be obtained from water utilities servicing the city.

24 Reporting and record maintenance

Reports on city indicators shall compile the data required in the individual test methods used.

Annex A

(informative)

City indicators

Table A.1 — City services and quality of life indicators

Theme	Core indicator	Supporting indicator	Profile indicator
Economy (Clause 5)	— City's unemployment rate	— Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties — Percentage of persons in full-time employment — Youth unemployment rate — Number of businesses per 100 000 population — Number of new patents per 100 000 population per year — Annual number of visitor stays (overnight) per 100 000 — Commercial air connectivity (number of non-stop commercial air destinations)	— Average household income (USD) — Annual inflation rate based on average of the past five years — City product per capita (USD)
Education (Clause 6)	— Percentage of female school-aged population enrolled in schools — Percentage of students completing primary education: survival rate — Percentage of students completing secondary education: survival rate — Primary education student-teacher ratio	— Percentage of school-aged population enrolled in schools — Number of higher education degrees per 100 000 population	
Energy (Clause 7)	— Total end-use energy consumption per capita (GJ/year) — Percentage of total end-use energy derived from renewable sources — Percentage of city population with authorized electrical service (residential)	— Electricity consumption of public street lighting per kilometre of lighted street (kWh/year) — Average annual hours of electrical service interruptions per household	— Heating degree days — Cooling degree days

Table A.1 (continued)

Theme	Core indicator	Supporting indicator	Profile indicator
	— Number of gas distribution service connections per 100 000 population — Final energy consumption of public buildings per year (GJ/m²)		
Environment and climate change (Clause 8)	— Fine particulate matter (PM_{2.5}) concentration — Particulate matter (PM₁₀) concentration — Greenhouse gas emissions measured in tonnes per capita	— NO₂ (nitrogen dioxide) concentration — SO₂ (sulfur dioxide) concentration — O₃ (ozone) concentration — Noise pollution — Percentage change in number of native species — Percentage of areas designated for natural protection	
Finance (Clause 9)	— Debt service ratio (debt service expenditure as a percentage of a municipality's own-source revenue) — Capital spending as a percentage of total expenditures	— Own-source revenue as a percentage of total revenues — Tax collected as a percentage of tax billed	— Gross operating budget per capita (USD) — Gross capital budget per capita (USD)
Governance (Clause 10)	— Women as a percentage of total elected to city-level office	— Number of convictions for corruption and/or bribery by city officials per 100 000 population — Number of registered voters as a percentage of the voting age population — Voter participation in last municipal election (as a percentage of registered voters)	
Health (Clause 11)	— Average life expectancy — Number of in-patient hospital beds per 100 000 population — Number of physicians per 100 000 population — Under age five mortality per 1 000 live births	— Number of nursing and midwifery personnel per 100 000 population — Suicide rate per 100 000 population	

Table A.1 (continued)

Theme	Core indicator	Supporting indicator	Profile indicator
Housing (Clause 12)	- Percentage of city population living in inadequate housing - Percentage of population living in affordable housing	- Number of homeless per 100 000 population - Percentage of households that exist without registered legal titles	- Total number of households - Vacancy rate (residential) - Persons per unit - Living space (square metres) per person - Secondary residence rate - Residential rental dwelling units as a percentage of total dwelling units
Population and social conditions (Clause 13)	Percentage of city population living below the international poverty line	- Percentage of city population living below the national poverty line - Gini coefficient of inequality	- Annual population change - Percentage of population that are foreign born - Population demographics - Percentage of population that are new immigrants - Percentage of city population that are non-citizens - Number of university students per 100 000 population
Recreation (Clause 14)		- Square metres of public indoor recreation space per capita - Square metres of public outdoor recreation space per capita	
Safety (Clause 15)	- Number of firefighters per 100 000 population - Number of fire-related deaths per 100 000 population - Number of natural-hazard-related deaths per 100 000 population - Number of police officers per 100 000 population - Number of homicides per 100 000 population	- Number of volunteer and part-time firefighters per 100 000 population - Response time for emergency response services from initial call - Crimes against property per 100 000 population - Number of deaths caused by industrial accidents per 100 000 population - Number of violent crimes against women per 100 000 population	

Table A.1 (continued)

Theme	Core indicator	Supporting indicator	Profile indicator
Solid waste (Clause 16)	— Percentage of city population with regular solid waste collection (residential) — Total collected municipal solid waste per capita — Percentage of the city's solid waste that is recycled — Percentage of the city's solid waste that is disposed of in a sanitary landfill — Percentage of the city's solid waste that is treated in energy-from-waste plants	— Percentage of the city's solid waste that is biologically treated and used as compost or biogas — Percentage of the city's solid waste that is disposed of in an open dump — Percentage of the city's solid waste that is disposed of by other means — Hazardous waste generation per capita (tonnes) — Percentage of the city's hazardous waste that is recycled	
Sport and culture (Clause 17)	— Number of cultural institutions and sporting facilities per 100 000 population	— Percentage of municipal budget allocated to cultural and sporting facilities — Annual number of cultural events per 100 000 population (e.g. exhibitions, festivals, concerts)	
Telecommunication (Clause 18)		— Number of internet connections per 100 000 population — Number of mobile phone connections per 100 000 population	
Transportation (Clause 19)	— Kilometres of public transport system per 100 000 population — Annual number of public transport trips per capita	— Percentage of commuters using a travel mode other than a personal vehicle — Kilometres of bicycle paths and lanes per 100 000 population — Transportation deaths per 100 000 population — Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods — Average commute time	— Number of personal automobiles per capita — Number of two-wheeled motorized vehicles per capita
Urban/local agriculture and food security (Clause 20)	— Total urban agricultural area per 100 000 population	— Amount of food produced locally as a percentage of total food supplied — Percentage of city population undernourished — Percentage of city population that is overweight or obese — Body Mass Index (BMI)	

Table A.1 (continued)

Theme	Core indicator	Supporting indicator	Profile indicator
Urban planning (Clause 21)	— Green area (hectares) per 100 000 population	— Areal size of informal settlements as a percentage of city area — Jobs-housing ratio — Basic service proximity	— Number of trees per 100 000 population — Population density (per square kilometre) — Built-up density
Wastewater (Clause 22)	— Percentage of city population served by wastewater collection — Percentage of the city's wastewater receiving centralized treatment — Percentage of population with access to improved sanitation	— Compliance rate of wastewater treatment	
Water (Clause 23)	— Percentage of city population with potable water supply service — Percentage of city population with sustainable access to an improved water source — Total domestic water consumption per capita (litres/day) — Compliance rate of drinking water quality	— Total water consumption per capita (litres/day) — Average annual hours of water service interruptions per household — Percentage of water loss (unaccounted for water)	

Annex B (informative)

Mapping of indicators to ISO 37101 issues and purposes

NOTE The profile indicators, which provide basic statistics and background information as an informative reference, are not included in [Table B.1](#).

Table B.1 — Mapping of indicators/ISO 37101 issues and purposes

ISO 37101 issues	Purposes in this document
Governance, empowerment and engagement	Attractiveness (ISO 37101) Social cohesion (ISO 37101) — 10.1 Women as a percentage of total elected to city-level office (core indicator) — 10.2 Number of convictions for corruption and/or bribery by city officials per 100 000 population (supporting indicator) — 10.3 Number of registered voters as a percentage of the voting age population (supporting indicator) — 10.4 Voter participation in last municipal election (as a percentage of registered voters) (supporting indicator) — 12.4 Percentage of households that exist without registered legal titles (supporting indicator) — 15.6 Number of volunteer and part-time firefighters per 100 000 population (supporting indicator) Well-being (ISO 37101) Responsible resource use (ISO 37101) — 9.1 Debt service ratio (debt service expenditure as a percentage of a municipality's own-source revenue) (core indicator) — 9.2 Capital spending as a percentage of total expenditures (core indicator) — 9.3 Own-source revenue as a percentage of total revenues (supporting indicator) — 9.4 Tax collected as a percentage of tax billed (supporting indicator)

Table B.1 (continued)

ISO 37101 issues	Purposes in this document
	Resilience (ISO 37101) — 9.1 Debt service ratio (debt service expenditure as a percentage of a municipality's own-source revenue) (core indicator) — 9.2 Capital spending as a percentage of total expenditures (supporting indicator) — 9.3 Own-source revenue as a percentage of total revenues (supporting indicator) — 9.4 Tax collected as a percentage of tax billed (supporting indicator) — 12.4 Percentage of households that exist without registered legal titles (supporting indicator) — 15.6 Number of volunteer and part-time firefighters per 100 000 population (supporting indicator) Preservation and improvement of environment
Education and capacity building	Attractiveness (ISO 37101) — 5.4 Youth unemployment rate (supporting indicator) — 6.6 Number of higher education degrees per 100 000 population (supporting indicator) Social cohesion (ISO 37101) — 5.4 Youth unemployment rate (supporting indicator) — 6.1 Percentage of female school-aged population enrolled in schools (core indicator) — 6.2 Percentage of students completing primary education: survival rate (core indicator) — 6.3 Percentage of students completing secondary education: survival rate (core indicator) — 6.5 Percentage of school-aged population enrolled in schools (supporting indicator) — 6.6 Number of higher education degrees per 100 000 population (supporting indicator) Well-being (ISO 37101) — 5.4 Youth unemployment rate (supporting indicator) — 6.1 Percentage of female school-aged population enrolled in schools (core indicator) — 6.2 Percentage of students completing primary education: survival rate (core indicator)