

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

First edition
2019-05

Sustainable cities and communities — Indicators for smart cities

*Villes et communautés territoriales durables — Indicateurs pour les
villes intelligentes*



Reference number
ISO 37122:2019(E)

© ISO 2019

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

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

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

Contents

Page

Foreword	xi
Introduction	xii
1 Scope	1
2 Normative references	1
3 Terms and definitions for cities	1
4 City indicators	2
5 Economy	3
5.1 Percentage of service contracts providing city services which contain an open data policy.....	3
5.1.1 General.....	3
5.1.2 Indicator requirements.....	4
5.1.3 Data sources.....	4
5.1.4 Data interpretation.....	4
5.2 Survival rate of new businesses per 100 000 population.....	4
5.2.1 General.....	4
5.2.2 Indicator requirements.....	4
5.2.3 Data sources.....	5
5.3 Percentage of the labour force employed in occupations in the information and communications technology (ICT) sector.....	5
5.3.1 General.....	5
5.3.2 Indicator requirements.....	5
5.3.3 Data sources.....	6
5.4 Percentage of the labour force employed in occupations in the education and research and development sectors.....	6
5.4.1 General.....	6
5.4.2 Indicator requirements.....	6
5.4.3 Data sources.....	7
6 Education	7
6.1 Percentage of city population with professional proficiency in more than one language.....	7
6.1.1 General.....	7
6.1.2 Indicator requirements.....	7
6.1.3 Data sources.....	8
6.1.4 Data interpretation.....	8
6.2 Number of computers, laptops, tablets or other digital learning devices available per 1 000 students.....	8
6.2.1 General.....	8
6.2.2 Indicator requirements.....	8
6.2.3 Data sources.....	9
6.2.4 Data interpretation.....	9
6.3 Number of science, technology, engineering and mathematics (STEM) higher education degrees per 100 000 population.....	9
6.3.1 General.....	9
6.3.2 Indicator requirements.....	10
6.3.3 Data sources.....	10
6.3.4 Data interpretation.....	10
7 Energy	10
7.1 Percentage of electrical and thermal energy produced from wastewater treatment, solid waste and other liquid waste treatment and other waste heat resources, as a share of the city's total energy mix for a given year.....	10
7.1.1 General.....	10
7.1.2 Indicator requirements.....	11
7.1.3 Data sources.....	12

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

7.2	Electrical and thermal energy (GJ) produced from wastewater treatment per capita per year.....	12
7.2.1	General.....	12
7.2.2	Indicator requirements.....	12
7.2.3	Data sources.....	12
7.3	Electrical and thermal energy (GJ) produced from solid waste or other liquid waste treatment per capita per year.....	13
7.3.1	General.....	13
7.3.2	Indicator requirements.....	13
7.3.3	Data sources.....	13
7.4	Percentage of the city's electricity that is produced using decentralised electricity production systems.....	13
7.4.1	General.....	13
7.4.2	Indicator requirements.....	14
7.4.3	Data sources.....	14
7.4.4	Data interpretation.....	14
7.5	Storage capacity of the city's energy grid per total city energy consumption.....	14
7.5.1	General.....	14
7.5.2	Indicator requirements.....	15
7.5.3	Data sources.....	15
7.5.4	Data interpretation.....	15
7.6	Percentage of street lighting managed by a light performance management system.....	15
7.6.1	General.....	15
7.6.2	Indicator requirements.....	15
7.6.3	Data sources.....	16
7.7	Percentage of street lighting that has been refurbished and newly installed.....	16
7.7.1	General.....	16
7.7.2	Indicator requirements.....	16
7.7.3	Data interpretation.....	17
7.7.4	Data sources.....	17
7.8	Percentage of public buildings requiring renovation/refurbishment.....	17
7.8.1	General.....	17
7.8.2	Indicator requirements.....	17
7.8.3	Data sources.....	17
7.9	Percentage of buildings in the city with smart energy meters.....	18
7.9.1	General.....	18
7.9.2	Indicator requirements.....	18
7.9.3	Data sources.....	18
7.10	Number of electric vehicle charging stations per registered electric vehicle.....	19
7.10.1	General.....	19
7.10.2	Indicator requirements.....	19
7.10.3	Data sources.....	19
8	Environment and climate change.....	20
8.1	Percentage of buildings built or refurbished within the last 5 years in conformity with green building principles.....	20
8.1.1	General.....	20
8.1.2	Indicator requirements.....	20
8.1.3	Data sources.....	20
8.2	Number of real-time remote air quality monitoring stations per square kilometre (km ²).....	21
8.2.1	General.....	21
8.2.2	Indicator requirements.....	21
8.2.3	Data sources.....	21
8.3	Percentage of public buildings equipped for monitoring indoor air quality.....	21
8.3.1	General.....	21
8.3.2	Indicator requirements.....	21
8.3.3	Data sources.....	22

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

9	Finance	22
9.1	Annual amount of revenues collected from the sharing economy as a percentage of own-source revenue	22
9.1.1	General	22
9.1.2	Indicator requirements	22
9.1.3	Data sources	23
9.1.4	Data interpretation	23
9.2	Percentage of payments to the city that are paid electronically based on electronic invoices	23
9.2.1	General	23
9.2.2	Indicator requirements	23
9.2.3	Data sources	23
9.2.4	Data interpretation	23
10	Governance	24
10.1	Annual number of online visits to the municipal open data portal per 100 000 population	24
10.1.1	General	24
10.1.2	Indicator requirements	24
10.1.3	Data sources	24
10.2	Percentage of city services accessible and that can be requested online	24
10.2.1	General	24
10.2.2	Indicator requirements	24
10.2.3	Data sources	25
10.2.4	Data interpretation	25
10.3	Average response time to inquiries made through the city's non-emergency inquiry system (days)	25
10.3.1	General	25
10.3.2	Indicator requirements	25
10.3.3	Data sources	26
10.4	Average downtime of the city's IT infrastructure	26
10.4.1	General	26
10.4.2	Indicator requirements	26
10.4.3	Data sources	26
11	Health	27
11.1	Percentage of the city's population with an online unified health file accessible to health care providers	27
11.1.1	General	27
11.1.2	Indicator requirements	27
11.1.3	Data sources	27
11.2	Annual number of medical appointments conducted remotely per 100 000 population	27
11.2.1	General	27
11.2.2	Indicator requirements	28
11.2.3	Data sources	28
11.3	Percentage of the city population with access to real-time public alert systems for air and water quality advisories	28
11.3.1	General	28
11.3.2	Indicator requirements	28
11.3.3	Data sources	29
12	Housing	29
12.1	Percentage of households with smart energy meters	29
12.1.1	General	29
12.1.2	Indicator requirements	29
12.1.3	Data sources	29
12.2	Percentage of households with smart water meters	30
12.2.1	General	30
12.2.2	Indicator requirements	30
12.2.3	Data sources	30

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

13	Population and social conditions	30
13.1	Percentage of public buildings that are accessible by persons with special needs	30
13.1.1	General	30
13.1.2	Indicator requirements	30
13.1.3	Data sources	31
13.2	Percentage of municipal budget allocated for the provision of mobility aids, devices and assistive technologies to citizens with special needs	31
13.2.1	General	31
13.2.2	Indicator requirements	31
13.2.3	Data sources	31
13.3	Percentage of marked pedestrian crossings equipped with accessible pedestrian signals	32
13.3.1	General	32
13.3.2	Indicator requirements	32
13.3.3	Data sources	32
13.4	Percentage of municipal budget allocated for provision of programmes designated for bridging the digital divide	32
13.4.1	General	32
13.4.2	Indicator requirements	32
13.4.3	Data sources	33
14	Recreation	33
14.1	Percentage of public recreation services that can be booked online	33
14.1.1	General	33
14.1.2	Indicator requirements	33
14.1.3	Data sources	33
15	Safety	34
15.1	Percentage of the city area covered by digital surveillance cameras	34
15.1.1	General	34
15.1.2	Indicator requirements	34
15.1.3	Data sources	34
15.1.4	Data interpretation	34
16	Solid waste	34
16.1	Percentage of waste drop-off centres (containers) equipped with telemetering	34
16.1.1	General	34
16.1.2	Indicator requirements	35
16.1.3	Data source	35
16.2	Percentage of the city population that has a door-to-door garbage collection with an individual monitoring of household waste quantities	36
16.2.1	General	36
16.2.2	Indicator requirements	36
16.2.3	Data sources	36
16.3	Percentage of total amount of waste in the city that is used to generate energy	36
16.3.1	General	36
16.3.2	Indicator requirements	37
16.3.3	Data sources	37
16.4	Percentage of total amount of plastic waste recycled in the city	37
16.4.1	General	37
16.4.2	Indicator requirements	37
16.4.3	Data sources	38
16.5	Percentage of public garbage bins that are sensor-enabled public garbage bins	38
16.5.1	General	38
16.5.2	Indicator requirements	38
16.5.3	Data sources	38
16.6	Percentage of the city's electrical and electronic waste that is recycled	38
16.6.1	General	38
16.6.2	Indicator requirements	39
16.6.3	Data sources	39

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

17	Sport and culture	39
17.1	Number of online bookings for cultural facilities per 100 000 population	39
17.1.1	General	39
17.1.2	Indicator requirements	39
17.1.3	Data sources	39
17.1.4	Data interpretation	40
17.2	Percentage of the city's cultural records that have been digitised	40
17.2.1	General	40
17.2.2	Indicator requirements	40
17.2.3	Data sources	40
17.3	Number of public library book and e-book titles per 100 000 population	40
17.3.1	General	40
17.3.2	Indicator requirements	41
17.3.3	Data sources	41
17.4	Percentage of city population that are active public library users	41
17.4.1	General	41
17.4.2	Indicator requirements	42
17.4.3	Data sources	42
17.4.4	Data interpretation	42
18	Telecommunication	42
18.1	Percentage of the city population with access to sufficiently fast broadband	42
18.1.1	General	42
18.1.2	Indicator requirements	42
18.1.3	Data sources	43
18.2	Percentage of city area under a white zone/dead spot/not covered by telecommunication connectivity	43
18.2.1	General	43
18.2.2	Indicator requirements	43
18.2.3	Data sources	43
18.3	Percentage of the city area covered by municipally provided Internet connectivity	44
18.3.1	General	44
18.3.2	Indicator requirements	44
18.3.3	Data sources	44
19	Transportation	44
19.1	Percentage of city streets and thoroughfares covered by real-time online traffic alerts and information	44
19.1.1	General	44
19.1.2	Indicator requirements	45
19.1.3	Data sources	45
19.2	Number of users of sharing economy transportation per 100 000 population	45
19.2.1	General	45
19.2.2	Indicator requirements	45
19.2.3	Data sources	45
19.2.4	Data interpretation	46
19.3	Percentage of vehicles registered in the city that are low-emission vehicles	46
19.3.1	General	46
19.3.2	Indicator requirements	46
19.3.3	Data sources	46
19.4	Number of bicycles available through municipally provided bicycle-sharing services per 100 000 population	46
19.4.1	General	46
19.4.2	Indicator requirements	47
19.4.3	Data sources	47
19.5	Percentage of public transport lines equipped with a publicly accessible real-time system	47
19.5.1	General	47
19.5.2	Indicator requirements	47

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

19.5.3	Data sources.....	48
19.6	Percentage of the city's public transport services covered by a unified payment system.....	48
19.6.1	General.....	48
19.6.2	Indicator requirements.....	48
19.6.3	Data sources.....	48
19.7	Percentage of public parking spaces equipped with e-payment systems.....	49
19.7.1	General.....	49
19.7.2	Indicator requirements.....	49
19.7.3	Data sources.....	49
19.8	Percentage of public parking spaces equipped with real-time availability systems.....	49
19.8.1	General.....	49
19.8.2	Indicator requirements.....	49
19.8.3	Data sources.....	50
19.9	Percentage of traffic lights that are intelligent/smart.....	50
19.9.1	General.....	50
19.9.2	Indicator requirements.....	50
19.9.3	Data sources.....	50
19.10	City area mapped by real-time interactive street maps as a percentage of the city's total land area.....	51
19.10.1	General.....	51
19.10.2	Indicator requirements.....	51
19.10.3	Data sources.....	51
19.11	Percentage of vehicles registered in the city that are autonomous vehicles.....	51
19.11.1	General.....	51
19.11.2	Indicator requirements.....	51
19.11.3	Data sources.....	52
19.12	Percentage of public transport routes with municipally provided and/or managed Internet connectivity for commuters.....	52
19.12.1	General.....	52
19.12.2	Indicator requirements.....	52
19.12.3	Data sources.....	52
19.13	Percentage of roads conforming with autonomous driving systems.....	52
19.13.1	General.....	52
19.13.2	Indicator requirement.....	52
19.13.3	Data sources.....	53
19.14	Percentage of the city's bus fleet that is motor-driven.....	53
19.14.1	General.....	53
19.14.2	Indicator requirement.....	53
19.14.3	Data sources.....	53
19.14.4	Data interpretation.....	53
20	Urban/local agriculture and food security.....	54
20.1	Annual percentage of municipal budget spent on urban agriculture initiatives.....	54
20.1.1	General.....	54
20.1.2	Indicator requirements.....	54
20.1.3	Data sources.....	54
20.2	Annual total collected municipal food waste sent to a processing facility for composting per capita (in tonnes).....	54
20.2.1	General.....	54
20.2.2	Indicator requirements.....	55
20.2.3	Data sources.....	55
20.2.4	Data interpretation.....	55
20.3	Percentage of the city's land area covered by an online food-supplier mapping system.....	55
20.3.1	General.....	55
20.3.2	Indicator requirements.....	55
20.3.3	Data sources.....	56
21	Urban planning.....	56
21.1	Annual number of citizens engaged in the planning process per 100 000 population.....	56

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

21.1.1	General.....	56
21.1.2	Indicator requirements.....	56
21.1.3	Data sources.....	57
21.2	Percentage of building permits submitted through an electronic submission system.....	57
21.2.1	General.....	57
21.2.2	Indicator requirements.....	57
21.2.3	Data sources.....	57
21.3	Average time for building permit approval (days).....	57
21.3.1	General.....	57
21.3.2	Indicator requirements.....	57
21.3.3	Data sources.....	58
21.3.4	Data interpretation.....	58
21.4	Percentage of the city population living in medium-to-high population densities.....	58
21.4.1	General.....	58
21.4.2	Indicator requirements.....	58
21.4.3	Data sources.....	58
22	Wastewater.....	59
22.1	Percentage of treated wastewater being reused.....	59
22.1.1	General.....	59
22.1.2	Indicator requirements.....	59
22.1.3	Data sources.....	59
22.1.4	Data interpretation.....	59
22.2	Percentage of biosolids that are reused (dry matter mass).....	59
22.2.1	General.....	59
22.2.2	Indicator requirements.....	60
22.2.3	Data sources.....	60
22.3	Energy derived from wastewater as a percentage of total energy consumption of the city.....	60
22.3.1	General.....	60
22.3.2	Indicator requirements.....	61
22.3.3	Data sources.....	61
22.4	Percentage of total amount of wastewater in the city that is used to generate energy.....	61
22.4.1	General.....	61
22.4.2	Indicator requirements.....	61
22.4.3	Data sources.....	62
22.5	Percentage of the wastewater pipeline network monitored by a real-time data-tracking sensor system.....	62
22.5.1	General.....	62
22.5.2	Indicator requirements.....	62
22.5.3	Data sources.....	62
22.5.4	Data interpretation.....	62
23	Water.....	63
23.1	Percentage of drinking water tracked by real-time, water quality monitoring station.....	63
23.1.1	General.....	63
23.1.2	Indicator requirements.....	63
23.1.3	Data sources.....	63
23.1.4	Data interpretation.....	63
23.2	Number of real-time environmental water quality monitoring stations per 100 000 population.....	63
23.2.1	General.....	63
23.2.2	Indicator requirements.....	64
23.2.3	Data sources.....	64
23.3	Percentage of the city's water distribution network monitored by a smart water system.....	64
23.3.1	General.....	64
23.3.2	Indicator requirements.....	64
23.3.3	Data sources.....	65
23.3.4	Data interpretation.....	65

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

23.4	Percentage of buildings in the city with smart water meters.....	65
23.4.1	General.....	65
23.4.2	Indicator requirements.....	65
23.4.3	Data sources.....	66
24	Reporting and record maintenance.....	66
Annex A	(informative) Mapping of ISO 37122 indicators to ISO 37101 issues and purposes	67
Annex B	(informative) Mapping of ISO 37122 indicators to United Nations Sustainable Development Goals (SDGs) (2015).....	87
Bibliography	95

This is a preview of "ISO 37122:2019". [Click here to purchase the full version from the ANSI store.](#)

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.

The committee responsible for this document is ISO/TC 268, *Sustainable cities and communities*.

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

The indicators detailed in ISO 37120 have quickly become the international reference point for sustainable cities. ISO/TC 268/WG2 experts have identified the need for additional indicators for smart cities.

This document complements ISO 37120 and establishes indicators with definitions and methodologies to measure and consider aspects and practices that dramatically increase the pace at which cities improve their social, economic and environmental sustainability outcomes.

This document, when used in conjunction with ISO 37120, helps cities to identify indicators for applying city management systems such as ISO 37101 and to implement smart city policies, programmes and projects to:

- respond to challenges such as climate change, rapid population growth, and political and economic instability by fundamentally improving how they engage society;
- apply collaborative leadership methods, work across disciplines and city systems;
- use data information and modern technologies to deliver better services and quality of life to those in the city (residents, businesses, visitors);
- provide a better life environment where smart policies, practices and technology are put to the service of citizens;
- achieve their sustainability and environmental goals in a more innovative way;
- identify the need for and benefits of smart infrastructure;
- facilitate innovation and growth;
- build a dynamic and innovative economy ready for the challenges of tomorrow.