



**International
Standard**

ISO 37124

**Sustainable cities and
communities — Guidance on the
use of ISO 37120, ISO 37122 and
ISO 37123**

**First edition
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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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*.

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 in the delivery of services, to monitor quality of life, and in order to create policies for sustainable futures. Existing indicators at the local level are often not standardized, consistent, or comparable over time or across cities. This is due to different definitions and methodologies in what is measured. ISO/TC 268 has developed a series of standards for standardizing city indicators, including ISO 37120 (indicators for sustainable cities), ISO 37122 (indicators for smart cities), and ISO 37123 (indicators for resilient cities). ISO 37120, ISO 37122 and ISO 37123 focus on city services and quality of life, smart city development and resilience planning as a contribution to a city's overall sustainability. This document provides guidance for users to implement ISO 37120, ISO 37122 and ISO 37123.

ISO 37120 has quickly become the international reference for sustainable cities. With increased use of ISO 37120, ISO/TC 268 has identified the need for additional indicators for smart cities and resilient cities. This demand for additional indicators led to the development of ISO 37122 on indicators for smart cities and ISO 37123 on indicators for resilient cities.

Both ISO 37122 and ISO 37123 are intended to be used in conjunction with ISO 37120. This guidance document is intended to support cities in implementing ISO 37120, ISO 37122 and ISO 37123. ISO 37120 is the core standard for sustainable cities. Cities conforming to ISO 37122 or ISO 37123 are intended to conform to ISO 37120 first. ISO 37122 and ISO 37123 were developed to support cities in their sustainability efforts by including the critical agendas of the smart and resilient city as essential for holistic city sustainability.

ISO 37120, ISO 37122 and ISO 37123 provide a holistic and integrated approach to sustainable development, including a set of standardized indicators for a uniform approach to the collection and standardization of city data, focussing on what is measured, and how that measurement is to be undertaken. The indicators contained within ISO 37120, ISO 37122 or ISO 37123 do not provide a value judgement, threshold or numerical target value.

The definition of cities as “[an] urban community falling under a specific administrative boundary” used in ISO 37120, ISO 37122 and ISO 37123 and this document, refers to the city administrative area. Using the city's administrative boundary, comparative values worldwide are more easily standardized. Moreover, cities report indicators in accordance with service delivery boundaries. This creates an opportunity to gather a better understanding of the city services provided and a clearer measure of residents' quality of life within a city's administrative boundary.

ISO 37120, ISO 37122 and ISO 37123 have been developed with cities of all sizes in mind. The standards can be used by small and medium-sized cities, as well as large cities. ISO 37120, ISO 37122 and ISO 37123 are 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.

In particular, ISO 37120, ISO 37122 and ISO 37123 and their indicators can be used for the implementation of the following standards: ISO 37101, ISO 37104, ISO 37106, ISO/TS 37107, ISO/TS 37151, ISO 37153, and ISO 37156.

This guidance document will support users in implementing ISO 37120, ISO 37122 and ISO 37123 on city data by:

- providing an overview of the ISO 37120, ISO 37122 and ISO 37123 standards;
- helping cities understand the importance of city indicators in supporting their sustainability efforts;
- providing guidance on how to use ISO 37120, ISO 37122 and ISO 37123 together for city indicators;
- showcasing international efforts and examples of how cities have implemented ISO 37120, ISO 37122 and ISO 37123.

The structure of ISO 37120, ISO 37122 and ISO 37123 reflects the relationship between sustainable, resilient, and smart development (see [Figure 1](#)).

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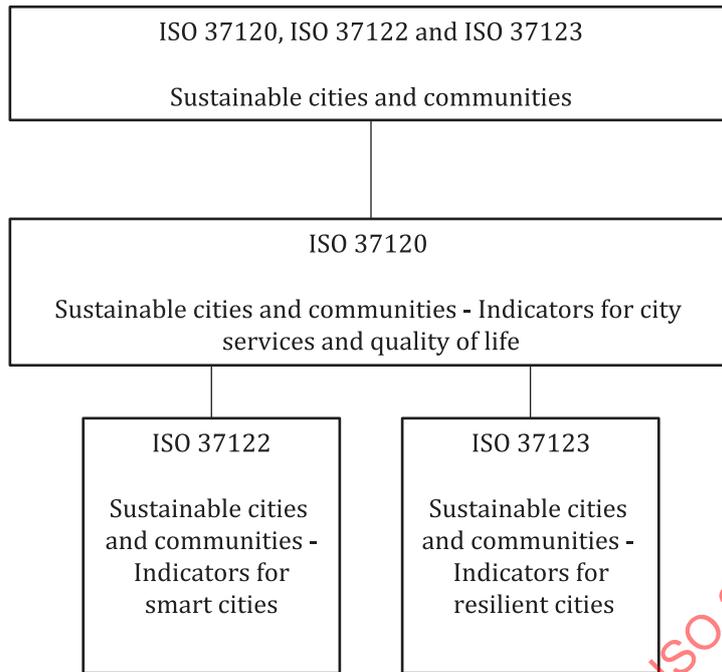


Figure 1 — Relationship between ISO 37120, ISO 37122 and ISO 37123 — Indicators for sustainable development of cities

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Sustainable cities and communities — Guidance on the use of ISO 37120, ISO 37122 and ISO 37123

1 Scope

This document provides guidance on how to use and implement ISO 37120, ISO 37122 and ISO 37123.

ISO 37120, ISO 37122 and ISO 37123 specify definitions and methodologies for a set of indicators to steer and measure the performance of city services as well as quality of life, smart city development and resilience planning. ISO 37120, ISO 37122 and ISO 37123 supports cities in achieving their goals towards sustainable development and includes indicators for measuring smart city development and risk assessments for building smart, resilient and sustainable cities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of 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 37120:2018, *Sustainable cities and communities — Indicators for city services and quality of life*

ISO 37122:2019, *Sustainable cities and communities — Indicators for smart cities*

ISO 37123:2019, *Sustainable cities and communities — Indicators for resilient cities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 37120, ISO 37122 and ISO 37123 apply.

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

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

4 Guidance for implementing ISO 37120, ISO 37122 and ISO 37123

4.1 General

ISO 37120 can be used on its own, while ISO 37122 and ISO 37123 are intended to be used together and in conjunction with ISO 37120 to provide the most comprehensive overview of city services and quality of life. In order to implement ISO 37122 or ISO 37123, ISO 37120 must be implemented.

ISO 37120 divides indicators into core and supporting indicators. Reporting core indicators is required by ISO 37120, while reporting supporting indicators is recommended. ISO 37122 and ISO 37123 do not contain core and supporting indicators. Users may select the indicators in ISO 37122 and ISO 37123 that are relevant and appropriate to their needs.

ISO 37120, ISO 37122 and ISO 37123 applies to cities of all sizes. Much of the data generated through the key performance indicators are normalized by 1/100 000th of the population. This approach enables cities of different sizes to benchmark and share lessons globally. In certain instances where countries have adopted ISO 37120, ISO 37122 and ISO 37123, information representing 1/1 000th of the population is collected.

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In those cases, a mathematical adjustment is necessary to reflect this difference in the resulting data. In certain cases, using the 1/1 000th methodology can be more applicable for small cities.

4.2 Sources of data for indicators in ISO 37120, ISO 37122 and ISO 37123

Data for the indicators in ISO 37120, ISO 37122 and ISO 37123 can be sourced from:

- city departments responsible for the specific services;
- national statistics bodies;
- sub-national or national ministries and departments;
- utilities and energy providers;
- NGOs and international organizations working on related measures;
- citizens;
- universities;
- other research bodies.

Indicators should be reported for the administrative boundary of the city, in order to ensure comparability globally. If data are not available for the administrative boundary of the city, the next available level should be reported (for example, from a county or regional level of government). This alternative boundary should be documented. However, efforts should be made to disaggregate this data to the city's administrative boundary and report this data accordingly in future years. A selection of indicators in ISO 37120, ISO 37122 and ISO 37123 can potentially be disaggregated for use in communities, business improvement areas and other specially designated areas. However, most of the indicators are concerned with service delivery across the city as a whole, and performance management by city administrations in that service delivery.

Some indicators, especially in ISO 37122, can require data from third-party technology and infrastructure providers. Often, this data is not shared with cities; therefore, it is important for cities to establish partnerships and open data protocols with third-party suppliers.

Data for many of the indicators in ISO 37123 can be sourced from international organizations with a specific focus on city resilience. Some data can be available from sub-national or national emergency response agencies, as well as international organizations that work on emergency response, such as the Red Cross.

[Clauses 5](#), [6](#) and [7](#) provide guidance on the implementation of ISO 37120, ISO 37122 and ISO 37123 respectively.

5 Guidance for implementing ISO 37120

5.1 General

ISO 37120 is the first international standard published for cities (the first edition was published in 2014). It specifies indicators to track and monitor the progress of city performance. When considering sustainable development through the lens of a city, the entire urban ecosystem needs to be considered. Planning for future needs should consider the current use and efficiency of resources to better plan for tomorrow.

The indicators and associated definitions and methodologies in ISO 37120 have been developed in order to help cities:

- a) measure the performance management of city services and quality of life over time;
- b) build high caliber city-level data sets across cities and city departments;
- c) exchange knowledge and best practices with peers globally through comparison across a wide range of performance measures;

- d) support data-informed policy development, economic development planning, and priority setting;
- e) respond to global climate challenges, health events and demographic change.

5.2 Indicators for performance management

Indicators in ISO 37120 have been selected to assist cities in measuring the performance of city services and quality of life. The indicators have been carefully selected based on the 19 city service themes outlined in ISO 37120, as prioritized by cities. The indicators provide a baseline and can help cities to assess and evaluate performance.

5.3 Indicators for benchmarking and comparison

Indicators in ISO 37120 can be used for benchmarking and comparison for learning and sharing across cities. The standardized methodologies set out in ISO 37120 enable city-to-city comparison and city-to-city exchange.

5.4 Indicators for building high caliber data sets

City data is often fragmented across city departments and embedded in different entities. Reporting indicators that conform to ISO 37120, ISO 37122 and ISO 37123 support cities in building high caliber data sets across different city departments and administrative entities.

5.5 Indicators for policy development, economic development planning, and priority setting

The indicators in ISO 37120 can be used for policy development, economic development planning, and priority setting. The indicators can be grouped and used to provide information on a particular topic, or they can be used to support, for example, a strategic set of planning priorities established by a city's leadership. The data can be used to inform decision makers on pertinent issues and to help with future planning. The indicators can be used in the city's strategic plans to track progress on priorities and goals set by the city council. Cities are able to cluster ISO 37120 indicators to build investment attractiveness and inform economic development planning into the future.

5.6 Indicators for responding to global climate challenges, health events, and demographic change.

The indicators in ISO 37120 can be used to respond to global climate challenges and help cities set targets and measure progress on global climate goals. To enable better planning, a number of the indicators in ISO 37120 support the measurement and tracking of environmental challenges and enable cities to monitor changes in, for example:

- air quality;
- GHG emissions;
- energy consumption;
- automobile usage;
- spatial development patterns.

The indicators in ISO 37120 can be used for responding to global health events, such as pandemics. When analysed together, the indicators can provide an overview of a city's services and infrastructure in the event of a local, national, or global health event. The indicators enable decision-makers to better understand the state of infrastructure and services in order to better plan for local, national, or global health events.

For example, it is important for cities to identify the number of hospital beds per 100,000 population and to know the number of hospital beds available in neighbouring cities. The number of hospital beds, the number of physicians and nurses, as well as other health indicators and population and social condition indicators provide an overview of the available services and infrastructure, as well as the needs and requirements of

the city population. Knowing city demographics (for example, the number and the percentage of the ageing population) is especially important in planning for a sustainable response to a local, national, or global health crisis. The indicators can also be used to assist cities with their recovery process from global health events, for example, drawing on economic indicators for post-crisis recovery.

The indicators in ISO 37120 also enable cities to track demographic changes, for example with age cohorts for young and ageing populations, to build data sets on growth, new immigrants and language diversity and create data-informed responses to closely related changes in demand for housing and education.

5.7 Criteria for selecting indicators

Users should select the indicators that are most relevant to their needs. Indicators can be selected based on the following:

- thematic groups:
 - economy;
 - education;
 - energy;
 - environment and climate change;
 - finance;
 - governance;
 - health;
 - housing;
 - population and social conditions;
 - recreation;
 - safety;
 - solid waste;
 - sport and culture;
 - telecommunication;
 - transportation;
 - urban/local agriculture and food security;
 - urban planning;
 - wastewater;
 - water;
- priority policy areas for a city:
 - health;
 - economic development;
 - infrastructure investment;
 - smart systems;
 - resilience;

- safety;
- sustainable development;
- attractiveness;
- preservation and improvement of environment;
- responsible resource use;
- social cohesion;
- well-being;
- peer groups:
 - demographics;
 - population;
 - population density;
 - city land area;
 - country;
 - region;
 - climate type;
 - country GDP per capita;
 - gross operating budget;
 - gross capital budget.

5.8 Data interpretation

Cities can analyse the indicators by themes, as defined in ISO 37120, or by specific policy areas based on the needs of the cities:

- strategic planning;
- ageing cities;
- child-friendly cities;
- sustainable finance;
- economic development;
- investment attraction;
- planning for new infrastructure investments;
- sustainable cities;
- green cities;
- resilient cities;
- smart cities;
- national and global health planning;
- climate resiliency.

The themes in this document are organized according to city services and quality of life.

The indicators are intended to be used for informational purposes, focusing on analysis and benchmarking. Cities do not always 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. As city governance is the closest level of government to citizens, this information is important for transparency, planning, and engaging in conversations around service provision deficits with higher orders of governments or private sector providers.

6 Guidance for implementing ISO 37122

6.1 General

ISO 37122 complements ISO 37120 and, when used in conjunction with it, 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 through the lens of the smart city. ISO 37122 also enables cities to analyse and understand specific needs for smart city development, which better enables planning, the measurement of year-over-year progress and the informed acquisition of smart city technologies and systems where necessary.

When used in conjunction with ISO 37120, ISO 37122 helps cities to identify indicators for applying city management systems such as ISO 37101. ISO 37122, when used in conjunction with ISO 37120, supports cities in establishing and implementing smart city policies, programs and projects to:

- respond to challenges, such as climate change, rapid population growth, local, national and global health events and political and economic instability, by fundamentally improving how they affect society;
- apply collaborative leadership methods, inspiring work across disciplines and city systems;
- use data and modern technology to deliver better services and quality of life to those in the city (residents, businesses, visitors);
- improve quality of life by ensuring that smart policies, practices and technology are used to improve service delivery;
- achieve sustainability and environmental goals in a more innovative and measured 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;
- measure the performance of smart city developments and investments over time;
- support policy development and priority setting;
- learn from one city to another by allowing comparison across a wide range of performance measures, and by sharing good practices.

Cities conforming to ISO 37122 must report at least 50 % of the ISO 37122 indicators as it is intended to be used in conjunction with ISO 37120.

6.2 How to use ISO 37122 indicators

The indicators in ISO 37122 are flexible and can be used as part of any smart city framework. When implementing ISO 37122, cities should select the relevant indicators for their smart city framework. The indicators, when used together with ISO 37120, provide cities with an overview of services and quality of life considerations that contribute to a smart city.

The indicators in ISO 37122 can also help cities measure a baseline to help identify smart city needs. The data can inform the effectiveness of a smart city project or solution once it has been implemented. It can be used to demonstrate the progress and benefits of smart city projects and solutions to city residents.

6.3 Guidance on how to use ISO 37122 in conjunction with ISO 37120

To conform to ISO 37122, users must also implement and conform to all of the requirements set out in ISO 37120. Since no core or supporting indicators exist in ISO 37122, users may choose which indicators to implement based on their smart city needs.

Once implemented, users can analyse the indicators from both ISO 37120 and ISO 37122 to provide an overview and assessment of their smart city initiatives. When implemented together, the full suite of indicators across the 19 themes consistent in ISO 37120 and ISO 37122 include 184 key performance indicators. This data can be used to guide cities in implementing smart city solutions and projects and track the progress and evaluation of such projects.

Users can implement and use ISO 37122 within any smart city framework.

7 Guidance for implementing ISO 37123

7.1 General

When ISO 37123 is used in conjunction with ISO 37120, it provides a set of indicators with standardized definitions and methodologies relevant to a city's resilience planning and assessment.

ISO 37123 focuses on city resilience. A resilient city is able to prepare for, recover from and adapt to shocks and stresses. This also includes the community's ability to adapt to a changing environment (see ISO 22316).

Cities are increasingly confronted by shocks, including extreme natural or human-made events which result in loss of life and injury, as well as material, economic, and environmental losses or impacts or both. These shocks can include floods, earthquakes, hurricanes, wildfires, pandemics, chemical spills and explosions, terrorism, power outages, financial crises, cyber-attacks and conflicts, as well as national, local and global health events. A resilient city is also able to manage and mitigate ongoing human and natural stresses that cause persistent negative impacts in a city relating to:

- a) environmental degradation (e.g. poor air and water quality);
- b) social inequality (e.g. chronic poverty and housing shortages);
- c) economic instability (e.g. rapid inflation and persistent unemployment).

A city's preparedness can be characterized by developing a detailed understanding of the city's risks, taking action to reduce vulnerability and exposure, and enhancing the awareness and participation of individuals, households and businesses.

A resilient city can recover from shocks and stresses in a timely and efficient manner, focusing on ensuring the continuity or rapid restoration of city services, such as electricity, water, telecommunications, waste management, sanitation, food distribution, financial services, and access to emergency services.

A resilient city is also a city that understands the necessity to adapt its systems and processes to ensure that they are as robust as possible in the face of shocks and stresses, enabling a plan to build back better following extreme events while focusing on the goal of restoring and ensuring long-term prosperity.

Resilience is both a core component and an essential enabler of sustainable development. Resilience measurement is a major contributor to the long-term sustainability of a city.

The indicators specified in ISO 37123 have been developed to help cities:

- 1) prepare for, recover from and adapt to shocks and stresses;
- 2) measure performance management in resilient city development over time;

- 3) support policy development and priority setting;
- 4) learn from one city to another by allowing comparison across a wide range of performance measures and sharing good practices.

To conform to ISO 37123, cities must implement and conform to ISO 37120. The indicators from ISO 37123 and ISO 37120 provide a basis for understanding the needs of an individualized, city-wide resilience strategy, better enabling planning toward becoming a resilient city. The indicators provide a holistic overview of a city's resilience and enable it to prepare for, recover from and adapt to shocks and stresses.

The indicators in ISO 37123 and ISO 37120 can be used with any resilience framework. They can also provide a reference point for cities that do not have resilience frameworks and would like to implement them. The data from ISO 37123 indicators can provide cities with a basic assessment of their resilience. A city can then use this assessment to decide what is needed for further resilience planning. Once cities have a baseline understanding of their resilience, they can determine what resilience framework they would like to implement. The data from ISO 37123 can be used to implement this framework. For example, cities successfully reporting indicators in conformity with ISO 37123 will fast-track a city to stage C as specified in *Making Cities Resilient 2030*.^[9]

7.2 Guidance on how to use ISO 37123 in conjunction with ISO 37120

To conform to ISO 37123, users must also implement and conform to ISO 37120. Since no core or supporting indicators exist in ISO 37123, users may choose which indicators to implement based on their resilience needs.

Once implemented, users may analyse indicators from both ISO 37120 and ISO 37123 to enable cities to better prepare for, recover from and adapt to shocks and stresses. When implemented together, the full suite of indicators across the 19 themes consistent in ISO 37120 and ISO 37123 includes 172 key performance indicators. The indicators enable cities to understand each other's resilience plans and learn from one another.

The indicators can be used to track and monitor progress towards a resilient city using any resilience framework.

City risk and hazard profiles can also provide information to support evidence-based investing.

8 Guidance on how to use ISO 37120, ISO 37122 and ISO 37123 in parallel across the 19 themes

The indicators in ISO 37120, ISO 37122 and ISO 37123 have been selected and developed according to consistent themes, and these indicators can be used in parallel across the 19 themes shown in [Tables 1 to 19](#). For example, users interested in having a holistic overview of a city's transportation system can analyse all of the indicators under the transportation theme across ISO 37120, ISO 37122 and ISO 37123.

Once implemented, users can select indicators for analysis across various themes and topics. A list of indicators across all themes from ISO 37120, ISO 37122 and ISO 37123 is shown in [Tables 1 to 19](#).

Table 1 — Economic indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Economy		
5.1 City's unemployment rate (core indicator) 5.2 Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties (supporting indicator) 5.3 Percentage of persons in full-time employment (supporting indicator) 5.4 Youth unemployment rate (supporting indicator) 5.5 Number of businesses per 100 000 population (supporting indicator) 5.6 Number of new patents per 100 000 population per year (supporting indicator) 5.7 Annual number of visitor stays (overnight) per 100 000 population (supporting indicator) 5.8 Commercial air connectivity (number of non-stop commercial air destinations) (supporting indicator) 5.9 Economy profile indicators 5.9.1 Average household income (USD) (profile indicator) 5.9.2 Annual inflation rate based on the average of the past five years (profile indicator) 5.9.3 City product per capita (USD) (profile indicator)	5.1 Percentage of service contracts providing city services which contain an open data policy 5.2 Survival rate of new businesses per 100 000 population 5.3 Percentage of the labour force employed in occupations in the information and communications technology (ICT) sector 5.4 Percentage of the labour force employed in occupations in the education and research and development sectors	5.1 Historical disaster losses as a percentage of city product 5.2 Average annual disaster loss as a percentage of city product 5.3 Percentage of properties with insurance coverage for high-risk hazards 5.4 Percentage of total insured value to total value at risk within the city 5.5 Employment concentration 5.6 Percentage of the workforce in informal employment 5.7 Average household disposable income

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Table 2 — Education indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Education		
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) 6.4 Primary education student-teacher ratio (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)	6.1 Percentage of city population with professional proficiency in more than one language 6.2 Number of computers, laptops, tablets or other digital learning devices available per 1 000 students 6.3 Number of science, technology, engineering and mathematics (STEM) higher education degrees per 100 000 population	6.1 Percentage of schools that teach emergency preparedness and disaster risk reduction 6.2 Percentage of population trained in emergency preparedness and disaster risk reduction 6.3 Percentage of emergency preparedness publications provided in alternative languages 6.4 Educational disruption

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Table 3 — Energy indicators

<p>ISO 37120:2018 (Sustainable cities) Subclause number</p>	<p>ISO 37122:2019 (Smart cities) Subclause number</p>	<p>ISO 37123:2019 (Resilient cities) Subclause number</p>
<p>Energy</p>		
<p>7.1 Total end-use energy consumption per capita (GJ/year) (core indicator) 7.2 Percentage of total end-use energy derived from renewable sources (core indicator) 7.3 Percentage of city population with authorized electrical service (residential) (core indicator) 7.4 Number of gas distribution service connections per 100 000 population (residential) (core indicator) 7.5 Final energy consumption of public buildings per year (GJ/m²) (core indicator) 7.6 Electricity consumption of public street lighting per kilometre of lighted street (kWh/year) (supporting indicator) 7.7 Average annual hours of electrical service interruptions per household (supporting indicator) 7.8 Energy profile indicators 7.8.1 Heating degree days (profile indicator) 7.8.2 Cooling degree days (profile indicator)</p>	<p>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 7.2 Electrical and thermal energy (GJ) produced from wastewater treatment per capita per year 7.3 Electrical and thermal energy (GJ) produced from solid waste or other liquid waste treatment per capita per year 7.4 Percentage of the city's electricity that is produced using decentralized electricity production systems 7.5 Storage capacity of the city's energy grid per total city energy consumption 7.6 Percentage of street lighting managed by a light performance management system 7.7 Percentage of street lighting that has been refurbished and newly installed 7.8 Percentage of public buildings requiring renovation/refurbishment 7.9 Percentage of buildings in the city with smart energy meters 7.10 Number of electric vehicle charging stations per registered electric vehicle</p>	<p>7.1 Number of different electricity sources providing at least 5 % of total energy supply capacity 7.2 Electricity supply capacity as a percentage of peak electricity demand 7.3 Percentage of critical facilities served by off-grid energy services</p>

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Table 4 — Environment and climate change indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Environment and climate change		
8.1 Fine particulate matter (PM2.5) concentration (core indicator) 8.2 Particulate matter (PM10) concentration (core indicator) 8.3 Greenhouse gas emissions measured in tonnes per capita (core indicator) 8.4 Percentage of areas designated for natural protection (supporting indicator) 8.5 NO ₂ (nitrogen dioxide) concentration (supporting indicator) 8.6 SO ₂ (sulphur dioxide) concentration (supporting indicator) 8.7 O ₃ (ozone) concentration (supporting indicator) 8.8 Noise pollution (supporting indicator) 8.9 Percentage change in number of native species (supporting indicator)	8.1 Percentage of buildings built or refurbished within the last 5 years in conformity with green building principles 8.2 Number of real-time remote air quality monitoring stations per square kilometre (km ²) 8.3 Percentage of public buildings equipped for monitoring indoor air quality	8.1 Magnitude of urban heat island effects (atmospheric) 8.2 Percentage of natural areas within the city that have undergone ecological evaluation for their protective services 8.3 Territory undergoing ecosystem restoration as a percentage of total city area 8.4 Annual frequency of extreme rainfall events 8.5 Annual frequency of extreme heat events 8.6 Annual frequency of extreme cold events 8.7 Annual frequency of flood events 8.8 Percentage of city land area covered by tree canopy 8.9 Percentage of city surface area covered with high-albedo materials contributing to the mitigation of urban heat islands

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Table 5 — Finance indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Finance		
9.1 Debt service ratio (debt service expenditure as a percentage of a city'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) 9.5 Finance profile indicators 9.5.1 Gross operating budget per capita (USD) (profile indicator) 9.5.2 Gross capital budget per capita (USD) (profile indicator)	9.1 Annual amount of revenues collected from the sharing economy as a percentage of own-source revenue 9.2 Percentage of payments to the city that are paid electronically based on electronic invoices	9.1 Annual expenditure on upgrades and maintenance of city service assets as a percentage of total city budget 9.2 Annual expenditure on upgrades and maintenance of storm water infrastructure as a percentage of total city budget 9.3 Annual expenditure allocated to ecosystem restoration in the city's territory as a percentage of total city budget 9.4 Annual expenditure on green and blue infrastructure as a percentage of total city budget 9.5 Annual expenditure on emergency management planning as a percentage of total city budget 9.6 Annual expenditure on social and community services as a percentage of total city budget 9.7 Total allocation of disaster reserve funds as a percentage of total city budget

Table 6 — Governance indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Governance		
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)	10.1 Annual number of online visits to the municipal open data portal per 100 000 population 10.2 Percentage of city services accessible and that can be requested online 10.3 Average response time to inquiries made through the city's non-emergency inquiry system (days) 10.4 Average downtime of the city's IT infrastructure	10.1 Frequency with which disaster-management plans are updated 10.2 Percentage of essential city services covered by a documented continuity plan 10.3 Percentage of city electronic data with secure and remote back-up storage 10.4 Percentage of public meetings dedicated to resilience in the city 10.5 Number of intergovernmental agreements dedicated to planning for shocks as percentage of total intergovernmental agreements 10.6 Percentage of essential service providers that have a documented business continuity plan

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Table 7 — Health indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Health		
11.1 Average life expectancy (core indicator) 11.2 Number of in-patient hospital beds per 100 000 population (core indicator) 11.3 Number of physicians per 100 000 population (core indicator) 11.4 Under age five mortality per 1 000 live births (core indicator) 11.5 Number of nursing and midwifery personnel per 100 000 population (supporting indicator) 11.6 Suicide rate per 100 000 population (supporting indicator)	11.1 Percentage of the city’s population with an online unified health file accessible to health care providers 11.2 Annual number of medical appointments conducted remotely per 100 000 population 11.3 Percentage of the city population with access to real-time public alert systems for air and water quality advisories	11.1 Percentage of hospitals equipped with back-up electricity supply 11.2 Percentage of population with basic health insurance 11.3 Percentage of population that is fully immunized 11.4 Number of infectious disease outbreaks per year

Table 8 — Housing indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Housing		
12.1 Percentage of city population living in inadequate housing (core indicator) 12.2 Percentage of population living in affordable housing (core indicator) 12.3 Number of homeless per 100 000 population (supporting indicator) 12.4 Percentage of households that exist without registered legal titles (supporting indicator) 12.5 Housing profile indicators 12.5.1 Total number of households (profile indicator) 12.5.2 Persons per unit (profile indicator) 12.5.3 Vacancy rate (residential) (profile indicator) 12.5.4 Living space (square meters) per person (profile indicator) 12.5.5 Secondary residence rate (profile indicator) 12.5.6 Residential rental dwelling units as a percentage of total dwelling units (profile indicator)	12.1 Percentage of households with smart energy meters 12.2 Percentage of households with smart water meters	12.1 Capacity of designated emergency shelters per 100 000 population 12.2 Percentage of buildings structurally vulnerable to high-risk hazards 12.3 Percentage of residential buildings not in conformity with building codes and standards 12.4 Percentage of damaged infrastructure that was “built back better” after a disaster 12.5 Annual number of residential properties flooded as a percentage of total residential properties in the city 12.6 Percentage of residential properties located in high-risk zones

Table 9 — Population and social conditions indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Population and social conditions		
13.1 Percentage of city population living below the international poverty line (core indicator)	13.1 Percentage of public buildings that are accessible by persons with special needs	13.1 Vulnerable population as a percentage of city population
13.2 Percentage of city population living below the national poverty line (supporting indicator)	13.2 Percentage of municipal budget allocated for the provision of mobility aids, devices and assistive technologies to citizens with special needs	13.2 Percentage of population enrolled in social assistance programmes
13.3 Gini coefficient of inequality (supporting indicator)	13.3 Percentage of marked pedestrian crossings equipped with accessible pedestrian signals	13.3 Percentage of population at high risk from natural hazards
13.4 Population and social conditions profile indicators	13.4 Percentage of municipal budget allocated for provision of programmes designated for bridging the digital divide	13.4 Percentage of neighbourhoods with regular and open neighbourhood association meetings
13.4.1 Annual population change (profile indicator)		13.5 Annual percentage of the city population directly affected by natural hazards
13.4.2 Percentage of population that are foreign born (profile indicator)		
13.4.3 Population demographics (profile indicator)		
13.4.4 Percentage of population that are new immigrants (profile indicator)		
13.4.5 Percentage of city population that are non-citizens (profile indicator)		
13.4.6 Number of university students per 100 000 population (profile indicator)		

Table 10 — Recreation indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Recreation		
14.1 Square meters of public indoor recreation space per capita (supporting indicator)	14.1 Percentage of public recreation services that can be booked online	
14.2 Square meters of public outdoor recreation space per capita (supporting indicator)		

Table 11 — Safety indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Safety		
15.1 Number of firefighters per 100 000 population (core indicator) 15.2 Number of fire-related deaths per 100 000 population (core indicator) 15.3 Number of natural-hazard-related deaths per 100 000 population (core indicator) 15.4 Number of police officers per 100 000 population (core indicator) 15.5 Number of homicides per 100 000 population (core indicator) 15.6 Number of volunteer and part-time firefighters per 100 000 population (supporting indicator) 15.7 Response time for emergency response services from initial call (supporting indicator) 15.8 Crimes against property per 100 000 population (supporting indicator) 15.9 Number of deaths caused by industrial accidents per 100 000 population (supporting indicator) 15.10 Number of violent crimes against women per 100 000 population (supporting indicator)	15.1 Percentage of the city area covered by digital surveillance cameras	15.1 Percentage of city population covered by multi-hazard early warning system 15.2 Percentage of emergency responders who have received disaster response training 15.3 Percentage of local hazard warnings issued by national agencies annually that are received in a timely fashion by the city 15.4 Number of hospital beds in the city destroyed or damaged by natural hazards per 100 000 population

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Table 12 — Solid waste indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Solid waste		
16.1 Percentage of city population with regular solid waste collection (residential) (core indicator) 16.2 Total collected municipal solid waste per capita (core indicator) 16.3 Percentage of the city's solid waste that is recycled (core indicator) 16.4 Percentage of the city's solid waste that is disposed of in a sanitary landfill (core indicator) 16.5 Percentage of the city's solid waste that is treated in energy-from-waste plants (core indicator) 16.6 Percentage of the city's solid waste that is biologically treated and used as compost or biogas (supporting indicator) 16.7 Percentage of the city's solid waste that is disposed of in an open dump (supporting indicator) 16.8 Percentage of the city's solid waste that is disposed of by other means (supporting indicator) 16.9 Hazardous waste generation per capita (tonnes) (supporting indicator) 16.10 Percentage of the city's hazardous waste that is recycled (supporting indicator)	16.1 Percentage of waste drop-off centres (containers) equipped with telemetering 16.2 Percentage of the city population that has door-to-door garbage collection with individual monitoring of household waste quantities 16.3 Percentage of total amount of waste in the city that is used to generate energy 16.4 Percentage of total amount of plastic waste recycled in the city 16.5 Percentage of public garbage bins that are sensor-enabled public garbage bins 16.6 Percentage of the city's electrical and electronic waste that is recycled	16.1 Number of active and temporary waste management sites available for debris and rubble per square kilometre

Table 13 — Sport and culture indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Sport and culture		
17.1 Number of cultural institutions and sporting facilities per 100 000 population (core indicator) 17.2 Percentage of municipal budget allocated to cultural and sporting facilities (supporting indicator) 17.3 Annual number of cultural events per 100 000 population (exhibitions, festivals, concerts, etc.) (supporting indicator)	17.1 Number of online bookings for cultural facilities per 100 000 population 17.2 Percentage of the city's cultural records that have been digitized 17.3 Number of public library book and e-book titles per 100 000 population 17.4 Percentage of city population that are active public library users	

Table 14 — Telecommunication indicators

ISO 37120:2018 (Sustainable cities) Subclause number	ISO 37122:2019 (Smart cities) Subclause number	ISO 37123:2019 (Resilient cities) Subclause number
Telecommunications		
18.1 Number of internet connections per 100 000 population (supporting indicator) 18.2 Number of mobile phone connections per 100 000 population (supporting indicator)	18.1 Percentage of the city population with access to sufficiently fast broadband 18.2 Percentage of city area under a white zone/dead spot/not covered by telecommunication connectivity 18.3 Percentage of the city area covered by municipally provided Internet connectivity	18.1 Percentage of emergency responders in the city equipped with specialized communication technologies able to operate reliably during a disaster event

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