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Sustainable cities and communities — Environmental, social and governance (ESG) indicators for cities

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Foreword

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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).

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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

On a global scale, environmental, social and governance (ESG) principles are at the core of the discussion on responsible leadership in governments and private industries alike. Cities can leverage these principles to foster a more sustainable and inclusive prosperity for their citizens guided by data-driven management for sound governance into the future. However, a critical weakness has been identified in this field: a lack of standards and codes on how to measure ESG with comparable data, governed by standardized criteria and a trusted measurement platform. This lack of standardization has created a sense of skepticism in ESG assessments and organizations are seeking new guidance on how best to measure ESG performance.

It is within this global context of an evolving ESG ecosystem that cities are stepping up – understanding the need for standardization across ESG principles to ensure much-needed successes in municipal programming, planning and service delivery. To be successful in adopting ESG programs and strategies, city leaders need to be equipped with standardized criteria to build trusted measurement platforms. With standardized city-level data, city managers, planners, mayors and sector leaders will be better able to assess and track advances in a city's ESG profile. A subset of these key performance indicators (KPIs) can also be applied to measure results in regions, counties, provinces, states, countries and other geographic levels.

Worldwide, cities are already utilizing ISO 37120, ISO 37122 and ISO 37123 for cities to build standardized data sets to support their work in delivering services to their residents, in advancing quality of life, and in building smarter and more resilient futures for their cities. These municipal leaders recognize the importance of standardized data to support and validate their commitments to ESG. Figure 1 shows the relationship between the ISO 37120, ISO 37122 and ISO 37123 standards for cities.

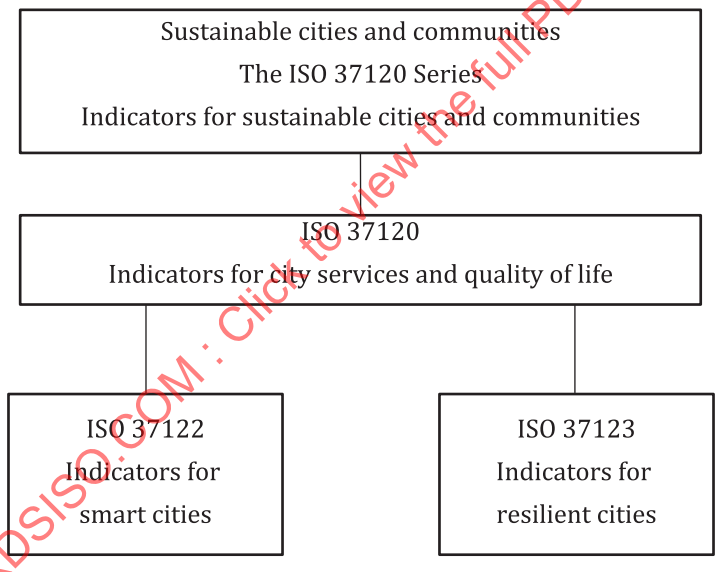

Figure 1 — Relationship between ISO 37120, ISO 37122 and ISO 37123

While KPIs (252 in total plus a set of profile indicators) exist across ISO 37120, ISO 37122 and ISO 37123 for cities that can support ESG measurements in cities, there are also gaps within these indicators. This document is designed to draw on both a sub-set of KPIs in ISO 37120, ISO 37122 and ISO 37123 for cities (see Annex A) and also to include new KPIs developed with full definitions and methodologies to fill these critical gaps, making this document a comprehensive ESG measurement platform for cities. This document includes a core set of fully numeric KPIs that will help city leaders worldwide to direct ESG-informed and ESG-driven municipal programming, planning and service delivery. This document, in conjunction with ISO 37120, ISO 37122 and ISO 37123 is intended to provide a complete set of indicators to better assess and track advances in a city's ESG profile.

Cities of all sizes and in line with their own purposes can use their ESG profile for setting benchmarks and milestones for their growth and development. Cities, governments and researchers can also make use of the ESG profiles for inter-city comparison. This document is a flexible tool designed to support cities across

objectives. Furthermore, indicators can be useful tools for other levels of government, including regional and other upper-tier governments when considering ESG objectives.

This document is developed with the understanding that cities are increasingly on the frontline in delivering services that improve quality of life for citizens, that protect the environment, consider equity and social needs, and prioritize social responsibility, underpinned by a strong model of governance and enduring legislation. This document will equip city leaders with data to nurture prosperous, inclusive, and liveable cities, with a high quality of life for residents, now and in the future.

Sustainable cities and communities — Environmental, social and governance (ESG) indicators for cities

1 Scope

This document specifies and establishes definitions and methodologies for a set of indicators to inform an environmental, social and governance (ESG) profile for cities.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
city
municipality
local government
urban or rural 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: City populations determined by census 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.

3.4
disaster
serious disruption to a city or community due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to human, material, economic and/or environmental losses and impacts

Note 1 to entry: Disasters can be frequent or infrequent, depending on the probability of occurrence and the return period of the relevant hazard.

3.5
drinking water
water intended for human consumption

Note 1 to entry: The term "potable water" is used instead of "drinking water" in ISO 37120 because it was published before ISO 24513. Both terms can be used interchangeably, but "potable water" is deprecated according to ISO 24513.

[SOURCE: ISO 24513:2019, 3.2.2.1, modified — Note 1 to entry replaced.]

3.6
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

3.7
gigajoule
measure of the energy that is equivalent to 1 X 10^9 Joules (J), where 1 J is the amount of energy required to send an electrical current of one ampere through a resistance of one ohm for one second

Note 1 to entry: One gigajoule (GJ) is equivalent to 277,8 kilowatt hours (kWh).

3.8
hazard
phenomenon, human activity or process that can cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation

Note 1 to entry: Hazards include biological, environmental, geological, hydro-meteorological and technological processes and phenomena. Biological hazards include pathogenic microorganisms, toxins and bioactive substances (e.g. bacteria, viruses, parasites, venomous wildlife and insects, poisonous plants, mosquitoes carrying disease-causing agents). Environmental hazards can be chemical, natural, radiological or biological, and are created by environmental degradation, physical or chemical pollution in the air, water and soil. However, many of the processes and phenomena that fall into this category can be “drivers” of hazard and risk rather than hazards themselves (e.g. soil degradation, deforestation, biodiversity loss, sea level rise). With respect to drinking water, ‘hazard’ can be understood as a microbiological, chemical, physical or radiological agent that causes harm to human health. Geological or geophysical hazards originate from internal earth processes (e.g. earthquakes, volcanic activity, landslides, rockslides, mud flows). Hydro-meteorological hazards are of atmospheric, hydrological or oceanographic origin (e.g. cyclones, typhoons, hurricanes, floods, drought, heatwaves, cold spells, coastal storm surges). Hydro-meteorological conditions can also be a factor in other hazards such as landslides, wildland fires and epidemics. Technological hazards originate from industrial or technological conditions, dangerous procedures, infrastructure failures or specific human activities (e.g. industrial pollution, nuclear radiation, toxic waste, dam failures, transport accidents, factory explosions, fires, chemical spills).

3.9
hazard map
map developed to illuminate areas that are affected or vulnerable to a particular hazard (e.g. earthquakes, landslides, rockslides)

3.10
hazardous waste
waste that is potentially harmful to human beings, property, or the environment

[SOURCE: ISO 18113-1:2022, 3.1.27, modified — Examples and notes to entry removed.]

3.11
high-risk hazard
hazard for which there is a likelihood of extreme event(s) based on hazard maps created by the city that can significantly either affect many properties in the city or have a major impact on the city, or both

3.12
indicator
quantitative, qualitative or descriptive measure

[SOURCE: ISO 15392:2019, 3.18]

3.13
labour force
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 varies by country.

3.14
natural hazard
geological or meteorological phenomena that can cause damage to physical infrastructure or loss of life in cities

3.15
primary education
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 years to 12 years. Primary education refers to children aged 5 years to 12 years or 1st grade through to 5th or 6th grade of school, as defined by local education systems.

3.16
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.

3.17
resilience
adaptive capacity of an organization in a complex and changing environment

Note 1 to entry: The Intergovernmental Panel on Climate Change (IPCC) defines resilience as "the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions."

Note 2 to entry: Resilience is the ability of an organization to resist being affected by an event or the ability to return to an acceptable level of performance in an acceptable period of time after being affected by an event.

[SOURCE: ISO Guide 73:2009, 3.8.1.7, modified — Notes 1 and 2 to entry have been added.]

3.18
resilient city
city able to prepare for, recover from and adapt to shocks and stresses

Note 1 to entry: A resilient city can resist, absorb, accommodate, adapt to, transform and recover from the effects of disasters and shocks in a timely and efficient manner, including through the preservation and restoration of essential basic structures and services in a sustainable way, and through risk-management practices. It involves stakeholders and especially citizens in disaster risk reduction through co-creation processes; reduces vulnerability and exposure to natural and human-made disasters; and increases its capacity to respond to disasters, shocks and other unforeseen chronic stresses through enhanced preparedness.

Note 2 to entry: A resilient city is still able to thrive regardless of the hazards, shocks and stresses it faces. It has a focus on lesson learning, continuous improvement and building back better after disasters.

3.19
risk
effect of uncertainty on objectives

Note 1 to entry: An effect is a deviation from the expected — positive or negative.

Note 2 to entry: Uncertainty is the state, even partial, of deficiency of information related to understanding or knowledge of an event, its consequence or likelihood.

Note 3 to entry: Risk is often characterized by reference to potential "events" (as defined in ISO Guide 73:2009, 3.5.1.3) and "consequences" (as defined in ISO Guide 73:2009, 3.6.1.3), or a combination of these.

Note 4 to entry: Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated "likelihood" (as defined in ISO Guide 73:2009, 3.6.1.1) of occurrence.

[SOURCE: ISO 37100:2016, 3.4.12]

3.20
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 years and 13 years (age 12 being the most common). Secondary education usually ends 12 years or 13 years after the beginning of primary education (or around age 18). However, this can range from 11 years to 14 years after beginning school (or around age 17 years to 20 years).

3.21
shock
natural or human-made event that causes a disaster

EXAMPLE Flood, earthquake, volcanic eruption, hurricane, wildfire, pandemic, chemical spill or explosion, terrorism, power outage, financial crisis, cyber-attack and conflict.

3.22
stress
underlying human and natural pressure or tension that causes persistent negative impacts in a city relating to environmental degradation (e.g. poor air and water quality), social inequality (e.g. chronic poverty and housing shortages) and economic instability (e.g. rapid inflation and persistent unemployment)

3.23
solid waste
non-soluble, discarded solid materials, including sewage sludge, municipal garbage, industrial wastes, agricultural refuse, demolition wastes and mining residues

3.24
tertiary education
education provided by universities and other higher education institutions following secondary education

3.25
vulnerability
susceptibility of individuals, households, businesses, assets or systems in a city to the impacts of hazards, as determined by physical, social, economic and environmental factors, processes and conditions

4 ESG reporting for cities — General

Cities across the world are increasingly becoming centres for economic growth and innovation pivotal to the global economy, places of diverse populations, and crucial platforms for driving a more sustainable development trajectory, all requiring strong governance frameworks.

ESG factors are gaining importance worldwide. Corporations of all sizes are increasingly rated on their impact and performance on ESG factors. However, the existing frameworks for measuring ESG performance are multiple and varied and hence not globally standardized. Going forward, both private and public organizations will be defined by how they handle ESG-related risks and opportunities. There is a gap at the city level of governments worldwide in considering how to construct an ESG profile. Within a city, ESG factors are critical to its long-term sustainability and a solid, measurable framework to gauge these factors is now critical.

KPIs and globally comparative data are essential to drive positive impacts in cities, across key ESG priorities. This document supports cities in filling this gap.

5 ESG indicators

5.1 General

This document draws on a sub-set or "pooling" of selected KPIs from across ISO 37120, ISO 37122 and ISO 37123 that have been mapped to each of the three elements of ESG: "environmental", "social" and "governance". This document also includes additional KPIs that have been identified through a gap analysis for ESG.

This document suggests an integrated approach to an ESG framework allowing for the evaluation of opportunities and risks across activities and processes relevant to each of the three thematic domains. Each of the E, S, and G are inherently tied to one another, with criteria and objectives of each reflected in all three domains and contributing to citizen quality of life and state of the city in general. Below is a description of the KPIs that comprise ESG: "environmental", "social" and "governance".

5.2 E — Environmental

KPIs under the "environmental" domain of an ESG framework allow for the evaluation and monitoring of a broad range of environmental objectives generally linked to resource management and stewardship; climate change and resilience; and attributes of land, water, and air. These KPIs enable the measurement of energy consumption and types of production; waste disposal, diversion, and reuse; and commitment to evolving the use of resources driven by sustainability practices. Topics for consideration under this domain can include, but are not limited to, pollution, greenhouse gas (GHG) emissions, biodiversity, extreme climate, and materials and waste. Indicators under this thematic domain also provide a critical and quantitative framework to evaluate the efficacy of activities aimed toward the prevention, mitigation, and recovery from the shocks and stresses of climate change and climate change related events. The KPIs further facilitate the establishment of a systematic relationship between the way that land is used and environmental sustainability – more broadly – by evaluating land-use planning and characteristics, emissions, and air quality. Finally, KPIs under this thematic domain evaluate the impact of infrastructure on the climate and natural environment.

5.3 S — Social

KPIs under the "social" domain of an ESG framework allow for the evaluation of access by residents to systems and services that facilitate personal and community health and safety, inclusion, wellbeing, and capacity for success and flourishment. The KPIs measure access to, and quality of, healthcare and healthcare systems, safety and the ability of emergency services to provide timely and effective service, and the ways in which safety and health institutions are situated to address emerging and changing needs. Indicators under this thematic domain also serve as tools to evaluate access to systems by people, groups of people, and identities that have historically faced exclusion from these systems. Topics for consideration under this domain can include, but are not limited to, health, wellbeing, crime, disaster resilience, safety, diversity, decent labour, and equality. The KPIs can further determine quality of access to services that dictate wellbeing including housing, transit, and more generalized contributors towards a higher quality of life. Finally, KPIs under this thematic domain evaluate the ability of individuals and groups to access training and skills that propel economic growth and wellbeing, the institutions that provide these services, and the outcomes of these provisions.

5.4 G — Governance

KPIs under the "governance" domain of an ESG framework can help to evaluate the capacity of governments to understand and improve approaches to service delivery, growth and development, models for inclusive and fair, transparent governance, and preparedness for risks and opportunities. They consider physical, social, and online infrastructure dedicated to service delivery as well as the implementation, security, and effectiveness of government services and systems. They allow for the evaluation of fiscal management and responsibility of municipal governments as well provide foundations for continued investment in and growth of cities. Topics for consideration under this domain can include, but are not limited to, government finance, quality of public services, and citizen engagement. Further, these KPIs measure the way in which cities foster or inhibit participation by residents and address the barriers to good governance and effective

citizenship faced by various persons and groups of persons. Finally, indicators under this thematic category enable cities to understand the ways in which their processes and initiatives identify and address threats to good governance as well as opportunities for continued growth and improvement.

6 Environmental indicators

6.1 Final energy consumption of public buildings per year (GJ/m^2)

6.1.1 General

This indicator is derived from ISO 37120:2018, 7.5.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 GHG emissions and its ecological footprint, which can help combat climate change and promote a low-carbon economy.

6.1.2 Indicator requirements

Final energy consumption of public buildings per year shall be calculated as the final energy consumption of public buildings (GJ) within a city (numerator) divided by total floor space of these buildings in square metres (m^2) (denominator). The result shall be expressed as the final energy consumption of public buildings per year in gigajoules (GJ) per square metre (m^2).

Final energy consumption shall include both thermal and electrical energy consumption. Only city-owned or operated buildings shall be considered. Total floor space, and not just the footprint of the building, shall be considered toward the denominator.

6.2 Total residential electrical energy use per capita (kWh/year)

6.2.1 General

This indicator is derived from ISO 37120:2014[1)], 7.1.

This indicator shall be reported in accordance with the following requirements.

NOTE An understanding of how much electricity is currently being consumed is needed in order to effectively manage generation, consumption, and conservation of electricity. Residential areas are one of the major consumers of electricity and its associated resource use. All forms of electricity generation have some environmental impact.

6.2.2 Indicator requirements

Total residential electrical energy use per capita (kWh/year) shall be calculated as the total residential electrical usage of a city in kilowatt hours (numerator) divided by the total population of the city (denominator). The result shall be expressed as the total residential electrical energy use per capita in kilowatt hours/year.

6.2.3 Data sources

Data should be gathered from electricity providers. Electricity consumption statistics are typically collected in three categories: residential, commercial, and industrial.

NOTE Electricity providers typically report electricity consumption statistics by customer and not resident or they report consumption by sector (residential, commercial, and industrial) in bulk and then report more detailed statistics as averages.

1) Withdrawn.

6.3 Percentage of total electricity consumption from renewable sources

6.3.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.3.2 Indicator requirements

The percentage of total electricity consumption from renewable sources shall be calculated as the total consumption of electricity generated from renewable sources (numerator) divided by the city's total electricity consumption (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Consumption from renewable sources should include geothermal, solar, wind, hydro, tide and wave energy, and combustibles, such as biomass.

6.4 Electricity consumption of public street lighting per kilometre of lighted street (kWh/year)

6.4.1 General

This indicator is derived from ISO 37120:2018, 7.6.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.4.2 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 streetlights are present (denominator). The result shall be expressed as electricity consumption of public street lighting in kilowatt hours per kilometre per year.

The denominator shall be calculated using the centreline distance of the street. Lighted streets shall include other lighted areas within the city such as pathways, which should be reflected in both numerator and denominator. Only city-owned or -operated street lighting shall be considered toward both numerator and denominator.

For the purposes of this document, the street lighting should meet locally or nationally defined standards for illumination or the requirements set by the International Commission on Illumination, or both.[66]

NOTE Local or national regulations/standards can apply to street lighting.

6.5 Square metres of city owned/operated green roof space as a percentage of all roof space of all city-owned/operated buildings

6.5.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE Green roof space reduces the temperatures of the roof surface and surrounding area. Benefits of green roof space include, but are not limited to, reduced building energy use, improved air quality, reduced air pollution and reduced GHG emissions. These spaces offer increased benefits per square metre installed.

6.5.2 Indicator requirements

Square metres of green roof space as a percentage of all roof space of city-owned/operated buildings shall be calculated as the total square metres of green roof space of city-owned/operated buildings (numerator) divided by the total square metres of roof space of city-owned/operated buildings (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Square metres of green roof space refers to the square metres of vegetated roofing system which is functionally integrated onto a roof area. This can include, but is not limited to:

— extensive green roofs (natural low maintenance);

— intensive green roofs (high maintenance, parks and gardens including urban agriculture);

— simple/semi-intensive green roofs (moderate maintenance, grass/herbs/shrubs).

The roof space of city-owned/operated buildings refers to the total roof space of public buildings that are municipally owned or operated.

6.6 Number of electric vehicle (EV) charging station ports per registered electric vehicle (EV)

6.6.1 General

This indicator is derived from ISO 37122:2019, 7.10.

This indicator shall be reported in accordance with the following requirements.

NOTE Unlike conventional vehicles that use gasoline or diesel-powered engines, electric vehicles (EVs) are powered by electricity from batteries. EVs therefore emit fewer GHGs and tailpipe pollutants than conventional vehicles. EVs are also cheaper to operate because fuel costs are minimal or nil. However, with limited motor and battery capacity (meaning shorter travel range), electric cars need regular and convenient access to vehicle (i.e. battery) charging stations.

6.6.2 Indicator requirements

The number of EV charging station ports per registered EV shall be calculated as the total number of EV charging station ports in the city (numerator) divided by the total number of registered EVs in the city (denominator). The result shall be expressed as the number of EV charging station ports per registered EV.

EV shall refer to any means by which something or someone is carried or conveyed with an engine and wheels (including cars, buses, motorcycles and auto rickshaws, but not trains) and which runs fully or partially on a battery-powered electric motor. EVs, therefore, require “plugging in” to an electricity source to recharge their batteries. There are two types of EVs:

1) “hybrid” vehicles that are powered from a gasoline or diesel engine as well as an electric motor;

2) “battery electric” vehicles that are powered exclusively from a battery and require no liquid fuels.

Only hybrid vehicles that connect directly to a power source shall be counted toward the denominator. Only privately-owned vehicles shall be included. All ports shall be considered if they are open to the public.

Charging station ports shall refer to publicly accessible equipment, also called “electric vehicle supply equipment” (EVSE) that supplies electric energy for recharging battery EVs. Stations can have multiple ports, which shall each be counted separately, representing the number of vehicles that can be charged at one time. Charging stations are often provided in municipal parking locations by electric utility companies or at retail shopping centres by private companies. Some charging stations have advanced features such as smart metering, cellular capability and network connectivity.

Registered vehicle shall refer to any vehicle that has been officially listed or recorded with a government authority and that displays either a vehicle registration plate or a vehicle registration certificate, or both.

6.6.3 Data sources

Data for this indicator should be obtained from municipal or state departments or ministries responsible for transportation and vehicle registration in the city.

6.7 Number of hydrogen fuel cell vehicle charging nozzles per personal hydrogen fuel cell vehicle

6.7.1 General

This indicator shall be reported in accordance with the following requirements.

6.7.2 Indicator requirements

The number of hydrogen fuel cell vehicle charging nozzles per personal hydrogen fuel cell vehicle shall be calculated as the number of nozzles to fuel hydrogen fuel cell vehicles in the city (numerator) divided by the number of registered personal hydrogen fuel cell vehicles in the city (denominator). The result shall be expressed as the number of hydrogen fuel cell vehicle charging nozzles per personal hydrogen fuel cell vehicle.

Hydrogen fuel cell vehicles shall be defined as vehicles that generate electricity using oxygen from the air and compressed hydrogen and have compressed hydrogen stored on board the vehicle.

A nozzle is used to connect the hydrogen refuelling station with the hydrogen fuel cell vehicle. There can be more than one nozzle at each station. Stations shall not be counted in place of nozzles.

Personal hydrogen fuel cell vehicles refer to privately owned vehicles not used for commercial purposes.

6.8 Fine particulate matter (PM2,5) concentration

6.8.1 General

This indicator is derived from ISO 37120:2018, 8.1.

This indicator shall be reported in accordance with the following requirements.

NOTE 1 Fine particulate matter (PM) can cause major health problems in cities. According to the World Health Organization (WHO), any concentration of 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 The PM2,5 annual air quality guideline (AQG) level has been lowered by the WHO from 10 µg/m^3 to 5 µg/m^3. This reflects the new evidence of effects on mortality occurring at concentrations below 10 µg/m^3.

6.8.2 Indicator requirements

Fine particulate matter (PM2,5) 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 PM2,5 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 PM is inertially separated into one or more size fractions within the PM2,5 size range. The 24 h (daily) measurements of PM2,5 concentrations are forwarded to a database where yearly summaries for each monitoring station are computed.

Since data for PM2,5 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.

6.9 Percentage of designated natural protection areas

6.9.1 General

This indicator is derived from ISO 37120:2018, 8.4.

This indicator shall be reported 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)[79].

6.9.2 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 either for natural protection or biodiversity, or both, shall refer to areas under municipal, communal, natural and/or local protection/biodiversity schemes. Bodies of water can be considered toward both numerator and denominator. Archaeological sites shall be excluded.

6.10 Greenhouse gas (GHG) emissions measured in tonnes per capita

6.10.1 General

This indicator shall be reported in accordance with the following requirements.

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

6.10.2 Indicator requirements

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

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

The Global Protocol for Community-Scale GHG Emissions (GPC) refers to a multi-stakeholder consensus-based protocol for developing internationally recognized and accepted community-scale GHG 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:

a) stationary units;

b) mobile units;

c) waste;

d) 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.

NOTE 1 Guidance is available through the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories[2)].

NOTE 2 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.

See ISO 14064-1, ISO 14064-2 and ISO 14064-3 on GHGs for further guidance.

6.11 Number of real-time remote air quality monitoring stations per square kilometre (km^2)

6.11.1 General

This indicator is derived from ISO 37122:2019, 8.2.

This indicator shall be reported in accordance with the following requirements.

NOTE A remotely operated real-time air monitoring system can help to assess climate change impacts on the environment (e.g. air quality). Such systems can also provide real-time observations, data processing and analysis, giving people timely information on the city's air quality.

6.11.2 Indicator requirements

The number of real-time remote air quality monitoring stations per square kilometre (km^2) shall be calculated as the total number of real-time remote air quality monitoring stations in the city (numerator) divided by the city's land area (denominator). The result shall be expressed as the number of real-time remote air quality monitoring stations per km^2.

A monitoring station shall refer to a physical structure or device that uses specialized equipment and analytical methods to track pollutant levels, such as fine particles (PM2,5), carbon dioxide (CO_2) and sulfur dioxide (SO_2).

A real-time remote system shall refer to any form of technology that provides instantaneous information such as mobile applications. More specifically, a remote system consists of hardware, software, data and the people who use them. A remote system commonly includes communications technology, such as the Internet.

2) https://www.ghgprotocol.org/sites/default/files/ghgp/standards/GHGP_GPC_0.pdf

6.11.3 Data sources

The number of real-time remote air quality monitoring stations should be sourced from city departments or ministries that oversee the air quality of the city, though sources can vary between cities and may also include privately owned monitoring stations.

6.12 Percentage of city land area covered by tree canopy

6.12.1 General

This indicator is derived from ISO 37123:2019, 8.8.

This indicator shall be reported in accordance with the following requirements.

NOTE A city's tree canopy coverage can have numerous benefits, including reduction of daytime air temperatures in hot seasons, improving air quality and strengthening social ties among neighbours. These factors can strengthen resilience while also help to attract businesses and residents.

6.12.2 Indicator requirements

The percentage of city area covered by tree canopy shall be calculated as the city land area covered by tree canopy (numerator) divided by the city's total land area (denominator). The result shall be multiplied by 100 and expressed as the percentage of city land area covered by tree canopy.

Tree canopy shall refer to the layered biomass of tree leaves, branches and stems that obscures the underlying ground surface when viewed from above.

6.12.3 Data sources

Data on tree canopy coverage should be sourced from local or regional conservation organizations or a ministry/department of environment, land use or urban planning. In addition, data should be sourced using geographic information system (GIS) tools and methods.

6.12.4 Data interpretation

Data should be considered through local context, as tree type and climate often impact canopy size and structure.

6.13 Annual expenditure allocated to ecosystem restoration in the city as a percentage of total city expenditures

6.13.1 General

This indicator is derived from ISO 37123:2019, 9.3.

This indicator shall be reported in accordance with the following requirements.

NOTE Ecosystem restoration is an effective way to strengthen ecological resilience and to mitigate hazards. It has multiple benefits, such as improved storm water management, water pollution control and reduced flooding and soil erosion.

6.13.2 Indicator requirements

Annual expenditure on ecosystem restoration as a percentage of total city expenditures shall be calculated as the total of all funds spent annually on ecosystem restoration assets for the specific purpose of enhancing the protective and other ecosystem services that enhance the resilience of the city (numerator) divided by the total city expenditures (denominator).

The result shall be multiplied by 100 and expressed as the expenditure on ecosystem restoration as a percentage of total city capital expenditures.

Ecosystem restoration shall refer to the process of recovering natural and semi-natural landscape elements (i.e. related to soil, water bodies and vegetation) that have been degraded, damaged or destroyed. Regular landscaping not for the purpose of ecosystem restoration shall not be considered toward the numerator. Bodies of water may be considered as objects of ecosystem restoration.

6.13.3 Data sources

Data on ecosystem restoration may be sourced from the city's capital and public works expenditures. Some elements of expenditure can also be sourced from the city's parks and conservation budgets. The total city expenditures used in this calculation should be sourced from the city's audited financial statements without amendment or variation.

6.13.4 Data interpretation

This indicator measures specific city expenditure to support and enhance the ecosystem services.

6.14 Percentage of city area impacted by either wildfire or forest fire, or both

6.14.1 General

This indicator shall be reported in accordance with the following requirements.

6.14.2 Indicator requirements

The percentage of city area impacted by either wildfire or forest fire, or both, shall be calculated as the total city land area impacted by either wildfire or forest fire, or both (numerator) divided by the city's total land area in square kilometres (km^2)(denominator). The result shall then be multiplied by 100 and expressed as the percentage of city area impacted by either wildfire or forest fire, or both.

City area impacted by either wildfire or forest fire, or both refers to the portion of landscape that has been burned by unplanned, unwanted wildland and/or forest fire within the municipal boundary.

Fire severity (also known as burn severity) refers to the degree to which a site has been altered or disrupted by fire, with focus on the impact on the ecosystem, including vegetation burn severity and soil burn severity.

In the context of satellite-based post-fire burn severity mapping, this indicator shall include areas burned at high, medium/moderate and low severity. The reporting of this indicator shall include unauthorized human-caused fires, escaped wildland fire events, escaped prescribed fire projects, and all other events that caused wildland fires.

The square kilometres (km^2) of city land area impacted by either wildfire or forest fire, or both should be reported separately by severity in Table 1.

Table 1 — City land area impacted by fire

	km^2
Impacted at a high severity	
Impacted at a medium/ moderate severity	
Impacted at a low severity	
Total	

6.14.3 Data interpretation

Fire severity is measured based on the Burned Area Emergency Response (BAER) fire severity table. This reports the aftermath impacts expressed as the percentage of vegetation killed, percentage of overstory tree mortality, and mineral soil impacts.

6.15 Percentage of households with smart energy meters

6.15.1 General

This indicator is derived from ISO 37122:2019, 12.1.

This indicator shall be reported in accordance with the following requirements.

This indicator has been placed under the "environment" domain as it fulfills the "...enable[ing] the measurement of energy consumption and types of production" element of "environment" as described in Clause 5. However, indicators under the ESG framework can have relationships to one or more thematic domains, and it is recommended that local context be applied when considering indicator application.

NOTE Smart energy meters record and display the consumption of energy in real time. Smart meter data can be sent to a central location wirelessly, thus providing electricity providers with the means to understand how and when power is being used to better plan and conserve energy. Also, smart meter data help consumers better understand and monitor energy usage.

6.15.2 Indicator requirements

The percentage of households with smart energy meters shall be calculated as the total number of households with smart energy meters (numerator) divided by the total number of households in the city (denominator). The result shall then be multiplied by 100 and expressed as the percentage of households with smart energy meters.

A smart energy meter shall refer to an energy meter that includes in-home, online visualized real-time digital displays or that is available through a real-time online application so customers can better understand their energy usage. Also, a smart energy meter can digitally send meter readings to an energy supplier for more accurate energy bills, and for better planning and conservation of energy by providers.

Where possible, the percentage of households with smart energy meters by type of energy should be reported separately in Table 2.

Table 2 — Percentage of households with smart energy meters by type of energy

	Percentage (%) of households with smart energy meters (by type of energy)
Electricity	
Gas	
Heat networks (district heating)	

6.15.3 Data sources

Data on smart energy meter figures should be sourced from local or regional energy providers, or relevant city departments or ministries that have data on local smart energy meters.

6.16 Percentage of households with smart water meters

6.16.1 General

This indicator is derived from ISO 37122:2019, 12.2.

This indicator shall be reported in accordance with the following requirements.

This indicator has been placed under the "environment" domain as it fulfills the "…enable[ing] the measurement of energy consumption and types of production" element of "environment" as described in Clause 5. However, indicators under the ESG framework can have relationships to one or more thematic domains, and local context should be applied when considering indicator application.

NOTE Smart water meters record and display the consumption of water in real time. Smart meter data can be sent to a central location wirelessly, thus providing water providers with the means to understand how and when water is being used to better plan and conserve water. Also, smart meter data help consumers better understand and monitor water usage.

6.16.2 Indicator requirements

The percentage of households with smart water meters shall be calculated as the total number of households with smart water meters (numerator) divided by the total number of households in the city (denominator). The result shall be multiplied by 100 and expressed as the percentage of households with smart water meters.

A smart water meter shall refer to a water meter that includes in-home real-time digital displays with online visualized real-time information or that is available through a real-time online application, so customers can better understand their water usage. Also, a smart water meter can digitally send meter readings to a water supplier for more accurate water bills, and for better planning and conservation of water by providers.

6.16.3 Data sources

Data on smart water meters should be sourced from local or regional water providers, or relevant city departments or ministries that hold data on local smart water meters.

6.17 Percentage recycled solid waste

6.17.1 General

This indicator is derived from ISO 37120:2018, 16.3.

This indicator shall be reported in accordance with the following requirements.

NOTE 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. 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 or petroleum-based fuels, or both.

6.17.2 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 diverted or disposed of 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 with the exception of materials biologically treated and used as compost or biogas, or processing residue, recovered and processed into new products following local government permits and regulations.[77]

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

The total amount of the city's solid waste that is recycled should be reported by type in Table 3.

Table 3 — Recycled solid waste disposal by type

	Residential	Commercial and industrial	Total
Percentage of solid waste recycled			
Total annual amount of the city's solid waste that is recycled in tonnes			
Total annual amount of solid waste diverted or disposed of in tonnes			

6.17.3 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 non-governmental organizations (NGOs) working in this area, may be consulted.

6.18 Percentage of solid waste disposed of in a sanitary landfill

6.18.1 General

This indicator is derived from ISO 37120:2018, 16.4.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.18.2 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 diverted or disposed of 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.

The city's solid waste that is disposed of in a sanitary landfill should be reported by type in Table 4.

Table 4 — Solid waste disposal in a sanitary landfill by type

	Residential	Commercial and industrial	Total
Percentage of solid waste disposed of in a sanitary landfill			
Total annual amount of the city's solid waste that is disposed of in a sanitary landfill			
Total annual amount of solid waste diverted or disposed of in tonnes			

6.18.3 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.

6.19 Percentage of solid waste treated in energy-from-waste plants

6.19.1 General

This indicator is derived from ISO 37120:2018, 16.5.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.19.2 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 diverted or disposed of 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 either electrical or heat energy, or both, from incinerated wastes. The facility should have a net energy efficiency higher than or equal to 0,25, i.e. the produced energy is higher than or equal to 25 % of incoming energy.

The city's solid waste that is treated in energy-from-waste plants should be reported by type in Table 5.

Table 5 — Solid waste treated in energy-from-waste plants by type

	Residential	Commercial and industrial	Total
Percentage of solid waste treated in energy from waste plants			
Total annual amount of the city's solid waste that is treated in energy from waste plants			
Total annual amount of solid waste diverted or disposed of in tonnes			

6.19.3 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.

6.20 Percentage of solid waste biologically treated and used as compost or biogas

6.20.1 General

This indicator is derived from ISO 37120:2018, 16.6.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.20.2 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 diverted or disposed of 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 (e.g. metals, glass) which is recycled, disposed in energy-from-waste plants, or landfills, shall be excluded from this indicator.

The city's solid waste that is biologically treated and used as compost should be reported by type in Table 6.

Table 6 — Solid waste biologically treated and used as compost by type

	Residential	Commercial and industrial	Total
Percentage of solid waste biologically treated and used as compost or biogas			
Total annual amount of the city's solid waste that is biologically treated and used as compost or biogas			
Total annual amount of solid waste diverted or disposed of in tonnes			

6.20.3 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.

6.21 Percentage of solid waste disposed of in an open dump

6.21.1 General

This indicator is derived from ISO 37120:2018, 16.7.

This indicator shall be reported in accordance with the following requirements.

NOTE 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. An open dump as a disposal method remains an alternative for some cities facing budgetary limitations, particularly in lower-income cities.

6.21.2 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 diverted or disposed of in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

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

The city's solid waste that is disposed of in an open dump should be reported by type in Table 7.

Table 7 — Solid waste disposal in an open dump by type

	Residential	Commercial and industrial	Total
Percentage of solid waste disposed of in an open dump			
Total annual amount of the city's solid waste that disposed of in an open dump			
Total annual amount of solid waste diverted or disposed of in tonnes			

6.21.3 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.

6.22 Percentage of solid waste disposed of by other means

6.22.1 General

This indicator is derived from ISO 37120:2018, 16.8.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.22.2 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 diverted or disposed of in the city in tonnes (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The city's solid waste that is disposed of by other means should be reported by type in Table 8.

Table 8 — Solid waste disposed of by other means by type

	Residential	Commercial and industrial	Total
Percentage of solid waste disposed of by other means			
Total annual amount of the city's solid waste that disposed of by other means			
Total annual amount of solid waste diverted or disposed of in tonnes			

6.22.3 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.

6.23 Household hazardous waste generation per capita (tonnes)

6.23.1 General

This indicator is derived from ISO 37120:2018, 16.9 with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 can 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 can lead to habitat fragmentation and the disruption of ecosystem functioning, which in turn can lead to species loss and the decreased ability of ecosystems to support human livelihoods and commercial activities.

6.23.2 Indicator requirements

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

Household 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. 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.

6.23.3 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.

6.24 Percentage of recycled household hazardous waste

6.24.1 General

This indicator is derived from ISO 37120:2018, 16.10 with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE 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;

— reduce reliance on raw materials and energy.

6.24.2 Supporting indicator requirement

The percentage of the city's household hazardous waste that is recycled shall be calculated as the total amount of household hazardous waste that is recycled in tonnes (numerator) divided by the total amount of household hazardous waste that is diverted or disposed of 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. Waste originating from non-household sources shall not be considered.

6.24.3 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.

6.25 Percentage of commuters using a travel mode to work other than a personal vehicle

6.25.1 General

This indicator is derived from ISO 37120:2018, 19.3.

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator has been placed under the "environment" domain as it fulfils the measurement of pollution and GHG emissions element of "environment" as described in Clause 5. However, indicators under the ESG framework can have relationships to one or more thematic domains, and local context should be applied when considering indicator application.

NOTE 2 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 (SOVs) is increasingly correlated with lower energy consumption and lower emissions of smog-producing chemicals. Micro-mobility and carpooling are particularly critical to this effort.

6.25.2 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 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 SOV shall include carpools, bus, minibus, train, tram, light rail, ferry, nonmotorized two-wheel vehicles such as bicycles and walking. Taxi and rideshare vehicles shall not be considered.

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 an 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.

6.25.3 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 logbook 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.

6.26 Percentage of registered low-emission vehicles

6.26.1 General

This indicator is derived from ISO 37122:2019, 19.3.

This indicator shall be reported in accordance with the following requirements.

NOTE Low-emission vehicles provide an alternative to traditional vehicles operating with internal combustion engines, which expel noxious gasses such as unburned hydrocarbons. Low-emission vehicles have the potential to improve local air quality.

6.26.2 Indicator requirements

The percentage of vehicles registered in the city that are low-emission vehicles shall be calculated as the total number of registered and approved low-emission vehicles registered in the city (numerator) divided by the total number of registered vehicles in the city (denominator). The result shall be multiplied by 100 and expressed as a percentage of vehicles registered in the city that are low-emission vehicles.

Low-emission vehicles shall refer to vehicles that emit low levels of emissions and can include electric, hybrid and hydrogen-fuel-cell-driven vehicles. Low-emission vehicles shall be certified under appropriate exhaust emission standards and the vehicle shall meet other special requirements applicable to conventional or clean-fuel vehicles and their fuels.

6.26.3 Data sources

The number of registered and approved low-emission vehicles should be sourced from city departments, or institutions that oversee vehicle registration.

6.27 Percentage of the city's bus fleet that does not burn or otherwise consume fuel

6.27.1 General

This indicator is derived from ISO 37122:2019, 19.14 with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE The deployment of public transport vehicles that do not burn or otherwise consume fuel helps cities to reduce operating costs and vehicle tailpipe emissions, while providing public transport users with an eco-friendly mode of transportation. Furthermore, public transport vehicles that do not burn or otherwise consume fuel reduce noise and vibrations that originate from engine systems, thereby improving passenger safety and comfort.

6.27.2 Indicator requirements

The percentage of the city's bus fleet that does not burn or otherwise consume fuel shall be calculated as the number of buses in the city's bus fleet that do not burn or otherwise consume fuel (numerator) divided by the total number of buses in the city's bus fleet (denominator). The result shall then be multiplied by 100 and expressed as the percentage of the city's bus fleet that does not burn or otherwise consume fuel.

Buses that do not burn or otherwise consume fuel may include buses propelled by motorized systems (instead of engine-driven systems that burn or otherwise consume fuel to perform mechanical work), and that use motors driven by electricity (magnetic forces), air, hydraulic pressure, heat, photons, electrons or ultrasound. Buses that do not burn or otherwise consume fuel include, but are not limited to, battery-powered systems containing fuel cells, and exclude biogas and internal combustion engine-driven systems requiring diesel.

6.27.3 Data sources

The data on the city's bus fleet should be sourced from relevant city departments that are responsible for a city's transit system.

6.27.4 Data interpretation

With regards to sustainability, sources of energy that supply the city's bus fleet should be taken into account.

6.28 Annual percentage of expenditures attributed to urban agriculture

6.28.1 General

This indicator is derived from ISO 37122:2019, 20.1 with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE Urban agriculture makes an important contribution to household food security, especially in times of crisis or food shortages. Locally produced food requires shorter supply chains and less transportation and refrigeration, and can thus help to conserve energy, water and other resources.

6.28.2 Indicator requirements

The annual percentage of municipal expenditures attributed to urban agriculture shall be calculated as the total amount of the city expenditures attributed to urban agriculture for a given year (numerator) divided by the city's total expenditures for the same year (denominator). The result shall then be multiplied by 100 and expressed as the annual percentage of municipal expenditures attributed to urban agriculture.

Urban agriculture shall refer to the growing of plants and food products from different types of crops (e.g. grains, root crops, vegetables, mushrooms, fruits). Urban agriculture also includes trees managed for producing fruit, and small-scale aquaculture. Urban agriculture expenditures can include, for example, city grants available to urban agriculture producers and businesses that can support the development of innovative technologies for urban agriculture (e.g. mobile applications to monitor crop yield) or simply provide urban agriculture producers and businesses with resources to support operations in general.

NOTE There can be local regulations that prohibit the raising of animals (e.g. poultry, rabbits, goats, sheep, cattle, pigs, guinea-pigs) within city limits.

6.28.3 Data sources

Data on amount of municipal expenditures attributed urban agriculture should be sourced from financial audited statements or relevant city departments that oversee finance.

6.29 Green area owned or operated by the city (hectares) per 100 000 population

6.29.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 21.1, with some methodological adjustment.

NOTE 2 The amount of either vegetated or natural surface cover, or both, 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 areas for urban inhabitants.

NOTE 3 The choice of per 100 000 population was made to permit cities of different sizes to be able to compare results with each other relatively easily and effectively. In some countries the statistic per 1 000 capita is collected and a slight mathematical adjustment can be necessary to reflect this difference to obtain an accurate comparison. The measure of per 1 000 population can be a more applicable measure for small cities.

6.29.2 Indicator requirements

Green area owned or operated by the city (hectares) per 100 000 population shall be calculated as the total area owned or operated by the city (in hectares) of green in the city (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as green area owned or operated by the city (hectares) per 100 000 population.

Green areas refer to the amount of either vegetated or natural surface cover, or both, in the city that is owned or operated by the city. Green area is broader than recreation space. Areas that are without green or natural surface cover are assumed to be sealed (i.e. paved or impervious).

Whenever possible, cities shall also record green area owned by other entities for reference and comparison in the following table:

Table 9 — Green area by ownership (hectares)

	Green area owned/ operated by the city	Green area owned/ operated by other levels of government	Green area privately owned and open to the public	Green area privately owned and not open to the public	Total green area (hectares)
Hectares					
Description of areas included					

6.29.3 Data sources

Information on green areas should be obtained from municipal recreation and parks departments, planning departments, forestry departments and census. Green areas can be delineated using either aerial photography or land use/land cover maps, or both.

6.30 Annual flood prevention expenditure as a percentage of total expenditures

6.30.1 General

This indicator is derived from ISO 37123:2019, 21.6.

This indicator shall be reported in accordance with the following requirements.

NOTE Floods can have serious consequences for people, economic activity, infrastructure and buildings, cultural heritage and the environment.

6.30.2 Indicator requirements

Annual expenditure on flood prevention measures as a percentage of the city total expenditures shall be calculated as the total expenditure on flood prevention measures (numerator) divided by the expenditures of the city (denominator). The result shall be multiplied by 100 and expressed as a percentage.

Flood prevention measures shall refer to building of buffer tanks/flood control works to confine water, adaptation of existing underground infrastructures (e.g. car parks) as holding tanks for storm water, landscaping of public spaces (e.g. parks) to serve as flood plains in case of flooding, and de-sealing interventions on spaces to de-waterproof the waterproofed surfaces. The numerator and denominator shall consider capital expenditures only. Operating expenditures shall be excluded.

6.31 Percentage of wastewater receiving centralized treatment

6.31.1 General

This indicator is derived from ISO 37120:2018, 22.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

6.31.2 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.

Centralized treatment shall refer to water treated in centralized wastewater treatment facilities. This includes primary, secondary, and tertiary treatment.

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 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 can 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 as 0.

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 10.

Table 10 — 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 centralized treatment/total volume of wastewater produced in the city and collected

6.32 Percentage of separated storm and sanitary sewers

6.32.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE Separating sewage from rainwater eliminates combined sewer overflow and prevents flooding by increasing sewer and drainage system capacity.

6.32.2 Indicator requirements

The percentage of sewer systems with separated storm and sanitary sewers shall be calculated as the total kilometres of sewer system with separated storm and sanitary sewers (numerator) divided by the total kilometres of sewer system (sanitary, storm, and combined). The result shall then be multiplied by 100 and expressed as the percentage of sewer system with separated storm and sanitary sewers.

A separated (or "separate") sewer system refers to a system that uses separate pipes to carry wastewater and stormwater. The pipes for wastewater connect directly to the wastewater treatment plant for further processing, while the pipes for stormwater connect directly to local waterways.

A combined sewer system refers to a system that uses a single pipe or a "combined sewer" to carry the flow of wastewater and stormwater to the local wastewater treatment plant. The total kilometres of sewer system refers to the total length of the sanitary, storm, and combined sewer systems.

Only publicly owned and operated sewer systems shall be considered. These systems are under the authority of the city, regional, or national government.

6.33 Total domestic water consumption per capita (litres/day)

6.33.1 General

This indicator is derived from ISO 37120:2018, 23.3, with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 drinking 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.

6.33.2 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 serviced city population (denominator). The result shall be expressed as the total domestic water consumption per capita in litres/day.

Water consumption for domestic use shall refer to water consumed for domestic purposes. Water consumed for industrial and commercial purposes shall be excluded. Only water consumed for domestic purposes shall be considered. This does not include water consumption from wells, cisterns, and other sources not administered by the city.

Total serviced city population shall include only those serviced by city water. The city population receiving water from wells, cisterns or other sources not administered by the city shall not be considered.

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 can be lost through leakage or illegal tapping. In cities with old and deteriorating water reticulation systems, a substantial proportion of piped water can 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.

6.33.3 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.

6.33.4 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 can temporarily spike with income as new appliances are purchased and until water prices increase, encouraging water-saving appliances to enter the market.

6.34 Total water consumption per capita (litres/day)

6.34.1 General

This indicator is derived from ISO 37120:2018, 23.5, with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 of water by individuals (e.g. drinking, bathing, washing, gardening) and industrial, commercial and agricultural entities. In many cities, the drinking 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.

6.34.2 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.

Total water consumption shall refer to water consumed for domestic and commercial and industrial use. Domestic water consumption from wells, cisterns, and other sources not administered by the city is excluded.

Cities in which a portion of the population receives water from sources other than directly from the city it itself (wells, cisterns, and other sources not administered by the city), shall perform a calculation to account for the fact that only the domestic service population consumes domestic water sources. The portion of water attributed to commercial and industrial sources shall be normalized by the entire population.

6.34.3 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.

6.35 Percentage of water loss (unaccounted for water)

6.35.1 General

This indicator is derived from ISO 37120:2018, 23.7.

This indicator shall be reported in accordance with the following requirements.

This indicator has been placed under the "environment" domain as it fulfils the "commitment to evolving the use of resources driven by sustainability practices" element of "environment" as described in Clause 5. However, indicators under the ESG framework can have relationships to one or more thematic domains, and local context should be applied when considering indicator application.

NOTE Before reaching the users, a part of the water supplied can be lost through leakage or illegal tapping. In cities with old and deteriorating water reticulation systems, a substantial proportion of piped water can 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.

6.35.2 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 the 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.

6.35.3 Data sources

Data should be obtained from water utilities servicing the city.

6.36 Environmental profile indicators

6.36.1 Annual frequency of extreme rainfall events

6.36.1.1 General

This indicator is derived from ISO 37123:2019, 8.4.

This indicator shall be reported in accordance with the following requirements.

NOTE Extreme rainfall events can cause flooding of low-lying areas (including residences, infrastructure and roads); overwhelm water sanitation systems, and damage urban lands dedicated to agriculture and forests within the city. Monitoring extreme rainfall events enables cities to anticipate probable changes in extreme weather, and to make sound investment and budgetary decisions regarding infrastructure and service-provision responsibilities. This monitoring of these extreme rainfall events can lead to better planning, preparation for and response to these events.

6.36.1.2 Profile indicator requirements

Annual frequency of extreme rainfall events shall be calculated as the number of extreme rainfall events in a given year.

Extreme rainfall events shall refer to precipitation events in which 50 mm or more of rain has fallen within the city over a 24 h period.

When relevant and available, more precise data at a subdivision level should be reported.

6.36.1.3 Data sources

Data on extreme rainfall events should be sourced from local or regional meteorological organizations or departments monitoring the environment and climate change.

6.36.1.4 Data interpretation

What can be considered extreme rainfall will vary between cities due to climate attributes. Data should be interpreted through the lens of local climate and other local factors.

6.36.2 Annual frequency of extreme snowfall events

6.36.2.1 General

This indicator shall be reported in accordance with the following requirements.

6.36.2.2 Profile indicator requirements

The annual frequency of extreme snowfall events shall be calculated as the number of extreme snowfall events in a given year. Extreme snowfall events refer to periods of localized intense snowfall that produces the depths of snow that put human health and well- being at risk.

Snow depth shall refer to the depth of accumulated snow on the ground, measured in centimetres (cm). Cities shall use their country level snow depth threshold. Country-specific extreme snowfall thresholds vary. For example, in Canada and the United States an extreme snowfall event can be defined as localized, intense snowfall producing snowfall amounts of 15 cm or more in 12 h or less.

Snow depth shall be measured to the nearest cm.

6.36.3 Annual frequency of extreme heat events

6.36.3.1 General

This indicator is derived from ISO 37123:2019, 8.5.

This indicator shall be reported in accordance with the following requirements.

NOTE During extreme heatwaves, mortality and morbidity increase among the general population, especially among vulnerable groups. This monitoring of these extreme heat events can lead to better planning, preparation for and response to these events.

6.36.3.2 Profile indicator requirements

Annual frequency of extreme heat events shall be calculated as the number of extreme heat events in a given year. Extreme heat events shall refer to an extended period of time (at least 72 h) with unusually hot weather conditions that put human health and well-being at risk. Country-specific air temperature thresholds for defining extreme heat events vary. For example, in Canada an extreme heat event can be defined as 72 h or more with air temperatures above 30 °C (86 °F) (or a specific community-based threshold), while in the United States it can be defined as temperatures above 32 °C (90 °F) (or a specific community-based threshold).

This indicator shall be reported using the country-specific method and temperature threshold.

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

When relevant and available, more precise data at a subdivision level should be reported.

6.36.3.3 Data sources

Data on extreme heat events should be sourced from local or regional meteorological organizations or departments monitoring the environment and climate change. It can also be available from insurance agencies.

6.36.3.4 Data interpretation

What can be considered extreme rainfall will vary between cities due to climate attributes. Data should be interpreted through the lens of local climate and other local factors.

6.36.4 Annual frequency of extreme cold events

6.36.4.1 General

This indicator is derived from ISO 37123:2019, 8.6

This indicator shall be reported in accordance with the following requirements.

NOTE During extreme cold events, mortality and morbidity increase among the general population, especially among vulnerable groups. This monitoring of these extreme cold events can lead to better planning, preparation for and response to these events.

6.36.4.2 Profile indicator requirements

The annual frequency of cold events shall be calculated as the number of extreme cold events in a given year.

Extreme cold events shall refer to an extended period of time (at least 72 h) with unusually cold weather conditions that put human health and well-being at risk. Country-specific air temperature thresholds for defining extreme cold events vary. For example, in Canada an extreme cold event can be defined as air temperatures or wind chills below −30 °C (−22 °F) (or a specific community-based threshold) for at least

72 h, while in the United States it can be defined as temperatures or wind chills below −29 °C (−20 °F) (or a specific community-based threshold).

This indicator shall be reported using the country-specific method and temperature threshold.

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

When relevant and available, more precise data at a subdivision level should be reported.

6.36.4.3 Data sources

Data on extreme cold events should be sourced from local or regional meteorological organizations or departments monitoring the environment and climate change.

6.36.5 Annual frequency of extreme wind events

6.36.5.1 General

This indicator shall be reported in accordance with the following requirements.

6.36.5.2 Profile indicator requirements

Annual frequency of extreme wind events shall be calculated as the number of extreme wind events in a given year.

Extreme wind events shall refer to sustained winds recorded at 62 km per hour (34 knots/39 miles per hour) or faster. This is a “gale”/ force 8 or faster on the Beaufort wind force scale and should last a minimum of 20 min in duration.

NOTE Wind speeds greater than force 12 on the Beaufort wind force scale are measured on the Saffir-Simpson scale.

6.36.6 Annual frequency of flood events

6.36.6.1 General

This indicator is derived from ISO 37123:2019, 8.7.

This indicator shall be reported in accordance with the following requirements.

NOTE Floods are the most common natural disaster and the leading cause of natural disaster fatalities worldwide. With the increasing frequency of climatic extremes, the occurrence and severity of urban flood events is intensifying. Cities can use annual flood frequency data to improve flood warning systems and to monitor and forecast flood disasters and water resources. This monitoring of these flood events can lead to better planning, preparation for and response to these events.

6.36.6.2 Profile indicator requirements

The annual frequency of flood events shall be calculated as the number of flood events in the city in a given year.

A flood event shall refer to an overflow of water onto normally dry land and may include the inundation of a normally dry area caused by a significant rise in the water level of a stream, lake, reservoir or coastal region. A flood event may also include pooling of water at or near the point of rainfall. Flooding is a longer-term event than flash flooding, lasting at least 72 h. [153]

6.36.6.3 Data sources

Data on flood events should be sourced from local or regional meteorological organizations or departments monitoring the environment and climate change.

6.36.7 Heating degree days

6.36.7.1 General

This indicator is derived from ISO 37120:2018, 7.8.1

This indicator shall be reported 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 days requiring space heating of buildings, while “cooling” degree days is a measure of the days requiring space cooling of buildings.

6.36.7.2 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 18,3 °C (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 representative reported values (e.g. airport, city centre).

6.36.8 Cooling degree days

6.36.8.1 General

This indicator is derived from ISO 37120:2018, 7.8.2.

This indicator shall be reported 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 days requiring space heating of buildings, while “cooling” degree days is a measure of the days requiring space cooling of buildings

6.36.8.2 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 18,3 °C (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).

6.36.9 Average annual snowfall

6.36.9.1 General

This indicator shall be reported in accordance with the following requirements.

6.36.9.2 Indicator requirements

Average annual snowfall shall be calculated as the sum total of 12 monthly snowfall values (in centimetres) for a single year (numerator) divided by 12 (denominator). The result shall be expressed as the average annual snowfall (cm) per year.

Average annual snowfall is a climate statistic to indicate the amount of snowfall of a city. Snowfall is the amount of accumulated snow that falls during a given period of time.

6.36.10 Average annual rainfall

6.36.10.1 General

This indicator shall be reported in accordance with the following requirements.

6.36.10.2 Indicator requirements

Average annual rainfall shall be calculated as the sum total of 12 monthly rainfall values (in millimetres) for a single year (numerator) divided by 12 (denominator). The result shall be expressed as the average annual rainfall (mm) per year.

Average annual rainfall is a climate statistic to indicate the amount of rainfall of a city. Rainfall is the amount of rain that falls during a given period of time.

6.36.11 Average annual temperature

6.36.11.1 General

This indicator shall be reported in accordance with the following requirements.

6.36.11.2 Indicator requirements

Average annual temperature shall be calculated as the sum total of 12 mean/average monthly air temperature values (in Celsius degrees) for a single year (numerator) divided by 12 (denominator). The result shall be expressed as the average annual temperature (in Celsius degrees).

Annual average temperature is a climate statistic to indicate the temperature of the city.

6.36.12 Number of personal automobiles per capita

6.36.12.1 General

This indicator is derived from ISO 37120:2018, 19.8.1.

This indicator shall be reported 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.

6.36.12.2 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 or those powered by hydrogen fuel cell shall be included.

6.36.13 Number of two-wheeled motorized vehicles per capita

6.36.13.1 General

This indicator is derived from ISO 37120:2018, 19.8.2.

This indicator shall be reported 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.

6.36.13.2 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 nonmotorized vehicles such as bicycles. It shall also not include e-bikes.

7 Social indicators

7.1 Unemployment rate

7.1.1 General

This indicator is derived from ISO 37120:2018, 5.1.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.1.2 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 who have arrangements for a future job or who will need to find employment are counted as unemployed [69]. Discouraged workers or the 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. The term "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

Over the years the international community has developed a framework of international agreements which seek to protect children from child labour, in particular the two important International Labour Organization (ILO) Conventions on the subject and more generally the UN Convention on the Rights of the Child. Although some progress is being made in reducing child labour, in many cases the rights contained in these international agreements are not fully applied in practice and enforced.

7.2 Percentage of persons in full-time employment

7.2.1 General

This indicator is derived from ISO 37120:2018, 5.3.

This indicator shall be reported in accordance with the following requirements.

NOTE The persons in full-time employment in the city 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.

7.2.2 Indicator requirements

The percentage of persons in full-time employment shall be calculated as the number of persons in fulltime 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.[69]

NOTE Employment is a formal labour market concept which is often complicated in developing countries with a large informal employment sector.

7.3 Youth unemployment rate

7.3.1 General

This indicator is derived from ISO 37120:2018, 5.4.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.3.2 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.[72] 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.

7.4 Employment level

7.4.1 General

This indicator is derived from ISO 37123:2019, 5.5.

This indicator shall be reported in accordance with the following requirements.

NOTE A diverse local economy is a key component of city resilience. Some communities can be dependent on a small number of industries for providing either employment or local taxation revenue, or both, rendering these communities vulnerable to chronic stresses associated with economic downturns and structural, industrial and technological changes.

7.4.2 Indicator requirements

Employment concentration shall be calculated as the number of people in the city employed in the three largest sectors of the local economy (as measured by total employment) (numerator) divided by the city's total labour force (denominator). The result shall be multiplied by 100 and expressed as a percentage.

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. This typically includes all working-age adults between the ages of 15 years and 64 years, but the specific age varies by country.

The sectors used for the calculation of this indicator should be defined as per the ISIC [144] or an equivalent classification.

7.4.3 Data sources

Data on employment concentration should be obtained through labour force surveys or city employment assessments administered by local, regional or national authorities/statistical bodies, or the ministry or department of labour and employment.

7.4.4 Data interpretation

This indicator should be considered in the broader context of the economic wealth and prosperity of the city.

7.5 Average disposable household income

7.5.1 General

This indicator is derived from ISO 37123:2019, 5.7.

This indicator shall be reported in accordance with the following requirements.

NOTE Average household disposable income is an important determinant of consumption and an indicator to measure people's economic well-being. In addition, average household disposable income is an indicator that can be used to set a baseline measuring the disposable income residents have to support their local retailers and engage with community organizations. Average household disposable income can also be used to measure the ability of households to support the local economy during economic downturns, ultimately serving as an indicator of a city's economic resiliency.

7.5.2 Indicator requirements

Average household disposable income shall be calculated as the total amount of income available for spending and saving, after subtracting income taxes and pension contributions, 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 disposable income in USD.

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

To make the conversation from local currency, cities should use the rates posted by the US Federal Reserve Bank, or another credible resource for currency conversion. Cities should also make note of the rate and date of conversion.

7.5.3 Data sources

Data should be gathered from the national census or a regional or local ministry, department or organization responsible for monitoring income statistics

7.6 Average annual consumer price index

7.6.1 General

This indicator shall be reported in accordance with the following requirements.

7.6.2 Indicator requirements

The Consumer Price Index (CPI) shall be calculated by comparing, through time, the cost of a fixed basket of goods and services. The annual average value shall be reported.

CPI basket components and weights shall be determined on the basis of local, state, or national definitions.

The CPI is a measure of the rate of price change for goods and services bought by consumers. It can include but is not limited to, measure of cost of food, shelter, household operations and furnishings, clothing and footwear, transportation, health and personal care, and recreation, education and reading.

7.7 Annual percentage change in average annual total electrical bill for residential customers per 500 kWh

7.7.1 General

This indicator shall be reported in accordance with the following requirements.

7.7.2 Indicator requirements

The annual percentage change in average annual total electrical bill for residential customers per 500 kWh shall be calculated as the average annual total electrical bill per 500 kWh for residential customers in the city for the reporting year minus the average annual total electrical bill per 500 kWh for residential customers in the city for the previous year (numerator) divided by the average annual total electrical bill per 500 kWh for residential customers in the city for the previous year. The result shall be multiplied by 100 and expressed as a percentage.

Commercial and industrial customers shall be excluded.

For cases where some residential customers are billed by use and some are billed according to a tiered pricing structure (fixed rate), a weighted average calculation shall be performed to determine the average total electrical bill for that year.

7.8 Annual percentage change in food costs

7.8.1 General

This indicator shall be reported in accordance with the following requirements.

7.8.2 Indicator requirements

The annual percentage change in cost of food shall be calculated as the annual average consumer price index for food in the city for the reporting year minus the annual average consumer price index for food in the city for the previous year (numerator) divided by the annual average consumer price index for food in the city for the previous year. The result shall be multiplied by 100 and expressed as the annual percentage change in cost of food.

The CPI is a measure of the rate of price change for goods and services bought by consumers. Food shall include food purchased at stores.

7.9 Percentage of students completing secondary education — Adjusted cohort rate

7.9.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 6.3 with some methodological adjustment.

NOTE 2 Survival rate or adjusted cohort graduation rate measures the holding power and internal efficiency of an education system.

7.9.2 Indicator requirements

The percentage of students completing secondary education (adjusted cohort graduation 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 an adjusted school cohort (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

An adjusted cohort is based on the number of students who enter the first grade of secondary school for the first time adjusted by adding into the cohort (denominator) any student who transfers in later in the first grade of secondary school or in the subsequent years of secondary school, emigrates to another country, changes to a different school board, or leaves the school board for any other reason.

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 If data for the adjusted cohort method are not available, the enrolment method can be used.

EXAMPLE School A has 100 first-time students in the first grade of secondary school in 2017-18. These students are assigned to cohort 2021 because they are expected to graduate in four years at the end of the 2020-21 school year.

Starting in 2017-18, the initial 2021 cohort is 100 students. Between 2017-18 and 2020-21:

— 5 students transfer in. They are added to the cohort.

— 3 students transfer out. They are removed from the cohort.

— 4 students drop out. They remain in the cohort.

— 95 students graduate by the end of the 2020-21 school year.

The numerator would therefore be 95 (total graduated students) and the denominator would be 102 (100+5-3).[3)]

7.9.3 Data sources

Since the calculation of this indicator is based on student-flow rates, the reliability of the adjusted cohort 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, adjusted cohort 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.

7.10 Primary education student–teacher ratio

7.10.1 General

This indicator is derived from ISO 37120:2018, 6.4.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.10.2 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, i.e. 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 equal one full student enrolment), this shall be noted.

The number of classroom teachers shall not include administrators or other non-teaching staff. Kindergarten or pre-school teachers 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.

3) This example is sourced from https://www.nj.gov/education/schoolperformance/grad/docs/Understanding%20Adjusted%20Cohort%20Graduation%20Rates.pdf

7.10.3 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.

7.10.4 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.

7.11 Number of higher education degrees per 100 000 population

7.11.1 General

This indicator is derived from ISO 37120:2018, 6.6.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 labour force 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.

7.11.2 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 1/100 000 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.

7.11.3 Data sources

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

7.12 Number of in-patient hospital beds per 100 000 population

7.12.1 General

This indicator is derived from ISO 37120:2018, 11.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 [94].

7.12.2 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 1/100 000 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 refer only to those used for acute care. Acute care refers to active but short-term treatment for the purpose of recovery, as opposed to for chronic or long-term conditions. 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.

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

7.12.3 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.

7.13 Number of physicians per 100 000 population

7.13.1 General

This indicator is derived from ISO 37120:2018, 11.3.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 [161].

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 1/100 000 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 workplace is in the city. A physician shall include general practitioners and specialists.

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

7.13.2 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.

7.14 Number of nursing personnel per 100 000 population

7.14.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 11.5 with some methodological adjustment.

NOTE 2 The number of nursing personnel is a good indication of the city's health system and the strength of its outreach for maternal health.

7.14.2 Indicator requirements

The number of nursing personnel per 100 000 population shall be calculated as the total number of nurses (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the number of nursing personnel per 100 000 population.

The number of nurses shall include actively practising nurses employed in public and private hospitals, clinics and other health facilities, including officially registered self-employed nurses. 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 can 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).

7.15 Average emergency department wait time for physician initial assessment (minutes)

7.15.1 General

This indicator shall be reported in accordance with the following requirements.

7.15.2 Indicator requirements

The average emergency department wait time for physician initial assessment shall be calculated as the total number of minutes from the time of arrival/registration to the time the patient is seen by a physician for an initial assessment in the reporting year (numerator) divided by the total number of patients registered in the reporting year (denominator). The result shall be expressed as the average emergency department wait time for physician initial assessment (minutes).

Wait time for physician initial assessment shall be measured from the time the patient arrives/registers in the emergency department to the time the patient is seen by a physician for a first assessment. Triage (the process by which patients are briefly assessed and prioritized based on the type and urgency of their condition, often by a nurse) shall not be considered the first assessment. A physician shall refer to someone who has obtained a graduate degree from a school of medicine.

Hospitalizations via other means (e.g. elective or planned admissions, direct admissions from a doctor's office or clinic or transfers from another facility) shall be excluded.

Table 11 should be completed:

Table 11 — Wait time by service type

Service type	Wait time (min)
Public healthcare	
Private healthcare	

7.16 Number of infectious disease outbreaks per year

7.16.1 General

This indicator is derived from ISO 37123:2019, 11.4.

This indicator shall be reported in accordance with the following requirements.

NOTE An infectious disease outbreak is a major potential shock for a city. The ability of a city to prepare for, recover from and adapt to an infectious disease outbreak is indicative of resilience.

7.16.2 Indicator requirements

The number of infectious disease outbreaks per year shall be calculated as the count of infectious disease outbreaks in a given year in the city.

An infectious disease shall refer to a disease caused by pathogenic microorganisms such as bacteria, viruses, parasites or fungi; the diseases can be spread, directly or indirectly, from one person to another.

An outbreak shall refer to an occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area or season. An outbreak can occur in a restricted geographical area or can extend over several countries. It can last for a few days or weeks, or for several years. An outbreak does not refer to the general presence of a disease in a given year, but rather the occurrence of multiple cases of that disease in a concentrated area [161].

7.16.3 Data sources

Data on the number of infectious diseases should be sourced from relevant local or regional ministries, departments or organizations responsible for disease surveillance and epidemiology.

7.16.4 Data interpretation

Public health surveillance ensures an ongoing, systematic collection, analysis and interpretation of health-related data essential to the planning, implementation and evaluation of public health practice. Surveillance is undertaken to enable disease prevention and control measures, especially in the case of disease outbreaks. Furthermore, public health surveillance, such as the tracking of disease outbreaks, is an essential communication point in forecasting and responding to disease outbreaks and incidents of regional, national and international significance.

7.17 Percentage of population living in affordable housing

7.17.1 General

This indicator is derived from ISO 37120:2018, 12.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.17.2 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 can 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 %.

7.17.3 Data sources

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

7.18 Residential rental dwelling units as a percentage of total dwelling units

7.18.1 General

This indicator is derived from ISO 37120:2018, 12.5.6.

This indicator shall be reported 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.

7.18.2 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.

7.19 Average wait time for either subsidised or social housing units, or both (months)

7.19.1 General

This indicator shall be reported in accordance with the following requirements.

7.19.2 Indicator requirements

The average wait time for either subsidised or social housing units, or both shall be calculated as the total number of months between registration and first offer of either subsidised or social housing units, or both for applications that are resolved in the reporting year (numerator) divided by total applications resolved in the reporting year (denominator). The result shall be expressed as the average wait time for either subsidised or social housing units, or both (months).

either subsidised or social housing units, or both shall refer to government-assisted housing that provides lower cost rental units to households meeting specific eligibility criteria. This housing must be subsidised by a level of government (e.g. city, region, state, province, country) or a non-profit housing partner. This can include but is not limited to:

— public housing (owned directly or indirectly by service managers);

— not-for-profit and co-operative housing spaces subsidised the government;

— government-funded rent supplement programs.

Eligibility criteria includes, but is not limited to, household income, citizenship/residency/refugee status, household size and composition, and a household's home ownership and subsidised/social housing history.

Any frozen period during the application period (e.g. when the applicant has not yet fulfilled the residence requirement; the applicant has requested to put his or her application on hold pending arrival of family members for family reunion; the applicant is imprisoned) shall be excluded.

7.20 Number of either subsidised or social housing units, or both as a % of total dwelling units in the city

7.20.1 General

This indicator shall be reported in accordance with the following requirements.

7.20.2 Indicator requirements

The number of either subsidised or social housing units, or both as a % of total dwelling units in the city shall be calculated as the number of either subsidised or social housing units, or both in the city (numerator) divided by the total dwelling units in the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

Either subsidised or social housing units, or both, shall refer to government-assisted housing that provides lower cost rental units to households meeting specific eligibility criteria. This housing must be subsidised by the city or another level of government (e.g. region, province, country), and owned/operated by a level of government (e.g. city, region, province, country) or a non-profit housing partner. This can include but is not limited to:

— public housing (owned directly or indirectly by service managers);

— not-for-profit and co-operative housing;

— rent supplement programs.

Eligibility criteria includes, but is not limited to, household income, citizenship/residency status, household size and composition, and a household's home ownership and subsidised/social housing history.

Dwelling units 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.

The number of either subsidised or social housing units, or both shall be reported separately in Table 12.

Table 12 — Subsidised/social housing units per sponsor

Sponsor	Number of units
City	
Region	
State/Province	
Country	
Not-for-profit	
Co-op	
Other (please specify)	

7.21 Number of homeless persons per 100 000 population

7.21.1 General

This indicator is derived from ISO 37120:2018, 12.3.

This indicator shall be reported in accordance with the following requirements.

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

NOTE 2 Homeless persons can also be referred to as "houseless persons".

7.21.2 Indicator requirements

The number of homeless persons per 100 000 population shall be calculated as the total number of homeless persons in the city (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the number of homeless persons per 100 000 population.

The following definition is used by the United Nations 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." [134]

7.22 Average annual number of shelter beds per 100 000 population

7.22.1 General

This indicator shall be reported in accordance with the following requirements.

7.22.2 Indicator requirements

The average annual number of shelter beds per 100 000 population shall be calculated as the average annual number of shelter beds in the city (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the average annual number of shelter beds per 100 000 population.

A shelter refers to an establishment for persons lacking a fixed address or for persons needing transitional shelter or assistance. A shelter bed refers to furniture allocated to a shelter resident that is meant for sleeping or resting.

Shelter beds can include, but are not limited to, beds in emergency shelters, transitional shelters and domestic violence shelters, men's shelters, women's shelters, youth shelters, and family shelters.

7.23 Percentage of residential properties located in high-risk zones

7.23.1 General

This indicator is derived from ISO 37123:2019, 12.6.

This indicator shall be reported in accordance with the following requirements.

NOTE Properties located in high-risk zones are especially vulnerable to damage or destruction during disaster events. Controlling the type and location of property development is a key strategy for cities to avoid and reduce risks from natural hazards.

7.23.2 Indicator requirements

The percentage of residential properties located in high-risk zones shall be calculated as the number of residential properties located in high-risk zones within the city (numerator) divided by the total number of residential properties in the city (denominator). The result shall be multiplied by 100 and expressed as the percentage of residential properties located in high-risk zones.

Residential properties shall refer to dwellings (or structures) classified for residential use. Examples of residential properties should include, but are not limited to, single-family dwellings, mobile dwellings, semi-detached dwellings, row houses, condominiums and apartment buildings.

High-risk zones shall refer to those areas of the city that are particularly vulnerable to natural hazards, such as flood plains, hillsides prone to mudslides and low-lying coastal areas. Hazard maps created by the city should be used to identify such areas and indicate the probability of occurrence of a relevant hazard. This indicator only refers to natural hazards. Safety/crime hazards, for example, shall not be considered.

7.23.3 Data sources

Mapping/delineation of hazards within the city is often a key responsibility of city governments. Information on hazard maps and the location of risk zones should be obtained from several departments and stakeholders, including GIS departments, emergency planners and research institutions.

7.24 Percentage of schools in high-risk zones

7.24.1 General

This indicator shall be reported in accordance with the following requirements.

7.24.2 Indicator requirements

The percentage of schools located in high-risk zones shall be calculated as the number of schools located in high-risk zones within the city (numerator) divided by the total number of schools in the city (denominator). The result shall be multiplied by 100 and expressed as the percentage of schools located in high-risk zones.

Schools refer to primary and secondary educational institutions in the city.

High-risk zones refer to those areas of the city that are particularly vulnerable to natural hazards, such as flood plains, hillsides prone to mudslides and low-lying coastal areas. Hazard maps created by the city should be used to identify such areas and indicate the probability of occurrence of a relevant hazard.

7.25 Capacity of designated emergency shelters per 100 000 population

7.25.1 General

This indicator is derived from ISO 37123:2019, 12.1.

This indicator shall be reported in accordance with the following requirements.

NOTE Emergency shelters are places of rest, reprieve and recuperation for people displaced by shocks and stresses. They are essential to a city's capacity for disaster preparedness and response, and therefore resilience.

7.25.2 Indicator requirements

Capacity of designated emergency shelters per 100 000 population shall be calculated as the total capacity of all designated emergency shelters in the city (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the capacity of designated emergency shelters per 100 000 population.

Capacity shall refer to the maximum, predetermined number of people who can be accommodated in an emergency shelter.

Emergency shelter shall refer to an existing structure that has been officially designated to be used for temporary housing for people whose previous housing is unsafe or unavailable during or after a disaster, or who are fleeing the effects of a disaster. Emergency shelters should be able to resist a disaster by virtue of their construction or location, or both.

7.25.3 Data sources

Information on designated emergency shelters should be sourced from emergency management authorities.

7.26 Percentage of city population living below the national poverty line

7.26.1 General

This indicator is derived from ISO 37120:2018, 13.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 United Nations Sustainable Development Goals (UNSDGs)[147].

7.26.2 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.

7.26.3 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, i.e. it can have the effect of underestimating the actual number of people who live below the poverty line.

7.27 Number of licensed early childhood education and care spaces per 1 000 pre-mandatory school-age population

7.27.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE The purpose of this indicator is primarily to measure day-based providers for when parents are at work. This indicator does not capture after school programs or seasonal day camps. Rather, it captures programs for children under the mandatory schooling age. These can be designed to bridge the home and school-based atmosphere.

7.27.2 Indicator requirements

The number of licensed early childhood education and care spaces per 1 000 pre-mandatory school-age population shall be calculated as the number of licensed early childhood education and care spaces (numerator) divided by 1/1 000 of the pre-mandatory school-age population in the city (denominator). The result shall be expressed as the number of licensed early childhood education and care spaces per 1 000 pre-mandatory school-age population.

Licensed early childhood education and care spaces refer to arrangements administered by a licensed provider in the city that provide education and care for children from age 0 to compulsory primary school age.

Childcare spaces refer to a unit of capacity representing one child to whom child care services are provided.

Both free and fee-based childcare spaces should be considered. All licensed childcare within the city boundary shall be counted.

The pre-mandatory school-age population refers to all children below the mandatory schooling age. Each city shall determine the age children begin attending mandatory schooling based on local regulation and report all children below that age. All children from the age of 0 to the mandatory school age should be considered (not including children of the mandatory school age).

Cities should report early childhood education and care spaces by provider in Table 13 below:

Table 13 — Early childhood education and care spaces by provider

Provider	Number of early childhood education and care spaces
City	
Province/State	
Country	
Private	

7.27.3 Data interpretation

Early childhood education and care services in countries vary widely in terms of decentralization, curriculum and funding structure.

7.28 Percentage of public buildings that are accessible to persons with special needs

7.28.1 General

This indicator is derived from ISO 37122:2019, 13.1.

This indicator shall be reported in accordance with the following requirements.

NOTE Public buildings that are accessible by persons with special needs create an inclusive city by removing barriers for persons affected by mobility challenges.

7.28.2 Indicator requirements

The percentage of public buildings that are accessible by persons with special needs shall be calculated as the number of public buildings within the city that are accessible by persons with special needs (numerator) divided by total number of public buildings in the city (denominator). The result shall then be multiplied by 100 and expressed as a percentage.

The definition of an accessible public building shall be based on the relevant national standard to identify, remove and prevent barriers so that people with special needs have more opportunities in everyday life. Accessible public buildings typically include these requirements:

— accessible parking spaces;

— accessible main entrance;

— automatic doors;

— sufficient light;

— accessible washrooms;

— elevators to all floors.

Public building shall refer to a city-owned or operated building that functions as a municipal and administrative office, library, recreation centre, hospital, school, fire station or police station.

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

NOTE 2 See also ISO 21542 for more information on the requirements for accessibility.

7.28.3 Data sources

Information should be obtained from the local authorities, officials, or the Ministry or Department responsible for public buildings.

7.29 Percentage of marked pedestrian crossings equipped with accessible pedestrian signals

7.29.1 General

This indicator is derived from ISO 37122:2019, 13.3.

This indicator shall be reported in accordance with the following requirements.

NOTE Accessible pedestrian signals enable persons with special needs to safely cross intersections and to perform their daily activities.

7.29.2 Indicator requirements

The percentage of marked pedestrian crossings equipped with accessible pedestrian signals shall be calculated as the number of marked pedestrian crossings equipped with accessible pedestrian signals (numerator) divided by the total number of marked pedestrian crossings (denominator). The result shall then be multiplied by 100 and expressed as the percentage of marked pedestrian crossings equipped with accessible pedestrian signals.

Accessible pedestrian signals shall refer to devices that communicate the intervals that a crossing is safe or unsafe to enter either using non-visual communication, usually audible or vibrotactile (i.e. vibrations), or as a complement to visual signals.

7.29.3 Data sources

Data on the percentage of marked pedestrian crossings equipped with accessible pedestrian signals should be sourced from city departments or ministries that oversee public pathways and traffic signals.

7.30 Percentage of population enrolled in social assistance programmes

7.30.1 General

This indicator is derived from ISO 37123:2019, 13.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 1 Providing social and financial assistance to disadvantaged and low-income persons helps ensure access to essential needs and maintenance of basic living standards. Social assistance can also help to reduce the vulnerability of recipient populations to shocks and stresses.

7.30.2 Indicator requirements

The percentage of the population enrolled in social assistance programmes shall be calculated as the number of people within the city enrolled in social assistance programmes (numerator) divided by the total population of the city (denominator). The result shall be multiplied by 100 and expressed as the percentage of population enrolled in social assistance programmes.

Social assistance shall refer to government-funded financial aid that provides support to families and individuals who cannot meet their basic living costs due to illness, disability, low income or unemployment. For some recipients, the need for assistance is temporary, while for others it is long term.

7.30.3 Data sources

Data on access to social assistance programmes should be sourced from the government agencies (at all tiers of government) responsible for providing these programmes.

7.31 Public indoor recreation space owned or operated by the city per capita

7.31.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 14.1 with some methodological adjustment.

NOTE 2 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.

7.31.2 Supporting indicator requirements

Square metres of public indoor recreation space owned or operated by the city per capita shall be calculated as the square metres of indoor public recreation space owned or operated by the city (numerator) divided by the population of the city (denominator). The result shall be expressed as square metres of indoor recreation space owned or operated by the city 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. Only city owned/operated recreation facilities shall be considered.

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

7.31.3 Data sources

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

7.32 Public outdoor recreation space owned or operated by the city per capita

7.32.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 14.2, with some methodological adjustment.

NOTE 2 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 includes outdoor recreation space.

7.32.2 Indicator requirements

Square metres of public outdoor recreation owned or operated by the city space per capita shall be calculated as square metres of outdoor public recreation space owned or operated by the city (numerator) divided by the population of the city (denominator). The result shall be expressed as m^2 of outdoor recreation space owned or operated by the city 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. Only city owned/operated recreational facilities shall be included.

For multi-use facilities, only the portion of the land devoted to recreation shall be counted. Double counting shall be avoided. For example, indoor facilities on parkland shall not be included.

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.

7.32.3 Data sources

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

7.33 Number of homicides per 100 000 population

7.33.1 General

This indicator is derived from ISO 37120:2018, 15.5.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.33.2 Indicator requirements

The number of homicides per 100 000 population shall be calculated as the number of reported homicides (numerator) divided by 1/100 000 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 death by suicide.

7.33.3 Data sources

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

7.34 Crimes against property per 100 000 population

7.34.1 General

This indicator is derived from ISO 37120:2018, 15.8.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.34.2 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 1/100 000 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.

7.35 Response time for emergency response services from initial call

7.35.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 15.7 with some methodological adjustment.

NOTE 2 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.

7.35.2 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 value shall be reported separately by type of emergency service provider as per Table 14.

Table 14 — Response time for emergency services from time of initial call

	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 (A)	Number of emergency responses (B)	Response time for emergency services from time of initial call (A ÷ B)
Ambulance services			
Fire services			
Police services			

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.

7.36 Number of police-reported violent crimes against women per 100 000 population

7.36.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 15.10 with some methodological adjustment.

NOTE 2 Violence against women is a global phenomenon. 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.

7.36.2 Indicator requirements

The number of police-reported violent crimes against women per 100 000 population shall be calculated as the total number of police-reported violent crimes against women (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the number of police-reported 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[142] 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 can include honour killings, rape, coercion or arbitrary deprivation of liberty, whether occurring in public or private life.

7.36.3 Data sources

Data on the number of police-reported 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, refuges, advocacy and other support.

NOTE Violence against women is often unreported and under-reported in many cities, and official registration of violent crimes against women can be under-represented.

7.37 Percentage of city population covered by multi-hazard early warning system

7.37.1 General

This indicator is derived from ISO 37123:2019, 15.1.

This indicator shall be reported in accordance with the following requirements.

NOTE This indicator refers to the specific warning of an imminent threat. Early warnings of that threat are essential to reduce human and economic losses from disasters. Warning systems prevent loss of life and mitigate the economic and material impacts of disasters. It is the responsibility of city governments to ensure that its citizens are effectively covered by some form of early warning system, enabling better preparedness for (and response to) shocks.

7.37.2 Indicator requirements

The percentage of city population covered by multi-hazard early warning systems shall be calculated as the total number of people within the city covered by multi-hazard early warning systems (numerator) divided by the city's total population (denominator). The result shall be multiplied by 100 and expressed as a percentage of population covered by multi-hazard early warning systems.

Early warning systems shall refer to an integrated and coordinated arrangement of hazard monitoring, forecasting and prediction, disaster risk assessment, and communication and preparedness activities that enable cities and residents to take action to reduce risks in advance of hazardous events.

Multi-hazard early warning systems cover a range of hazards and impacts and are ideally designed to be used in multi-hazard contexts where hazardous events can occur as a singular event, simultaneously, in succession or cumulatively over time, leading to a number of interrelated and cascading effects within a city. Warnings should be delivered over the maximum possible notice period via multiple media, including, but not limited to, phone, TV, radio, web and sirens.

Warnings should be reliable and specific to hazard type and should allow ample time for preparation and response (as far as technology permits).

Cellular notifications considered shall be push notifications. Push notifications refer to an alert (typically a pop-up or other message) generated by an application when the application is not open. Emergency broadcasts on multiple media outlets such as television and radio shall also be considered.

Notifications from all levels of government shall be considered.

NOTE The technology of disaster warnings is rapidly evolving, both in the long-term assessment of risk (e.g. seasonal weather forecast) and the notification period and update frequency for a specific event (e.g. landslide risk, tornado warnings, movement of flood crest). However, meaningful earthquake warning systems do not currently exist for practical purposes.

7.37.3 Data sources

The data for this indicator should be sourced from emergency management authorities.

7.38 Percentage of city area under a white zone/dead spot/not covered by telecommunication connectivity

7.38.1 General

This indicator is derived from ISO 37122:2019, 18.2.

This indicator shall be reported in accordance with the following requirements.

NOTE Telecommunication enables not only communication without barriers, but access to services such as the Internet. White zones and dead spots are therefore a hindrance to communication and access to basic services.

7.38.2 Indicator requirements

The percentage of the city area under a white zone/dead spot/not covered by telecommunication connectivity shall be calculated as the total city land area classified as being under a white zone/dead spot/not covered by telecommunication connectivity in square kilometres (numerator) divided by the city's total land area in square kilometres (denominator). The result shall then be multiplied by 100 and expressed as the percentage of the city area under a white zone/dead spot/not covered by telecommunication connectivity.

A white zone/dead spot/not covered by telecommunication connectivity shall refer to an area without telecommunication (i.e. Internet, telephone or mobile) connectivity and function, typically due to radio interference or range issues.

7.38.3 Data sources

Data on the city area under a white zone/dead spot/not covered by telecommunication connectivity should be sourced from local Internet service providers, or relevant city departments or ministries that oversee the building of telecommunication infrastructure.

7.39 Kilometres of public transit per 100 000 population

7.39.1 General

This indicator is derived from ISO 37120:2018, 19.1.

This indicator shall be reported in accordance with the following requirements.

NOTE 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 can tend to be more geographically compact and supportive of non-motorized modes of transportation.

7.39.2 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 1/100 000 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, bus rapid transit (BRT) 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 15.

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 15 — Kilometres of public transport by system type

	Type of public transport system	Kilometres in length
High-capacity systems	Heavy rail metro	
	Subway	
	Commuter rail	
	Other	
	Total (high capacity)	
Low-capacity systems	Light rail	
	Streetcars/tramways	
	Buses and trolleybuses	
	Bus Rapid Transit (BRT)	
	Other	
	Total (low capacity)	
	TOTAL (ALL SYSTEMS)	

7.39.3 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.

7.40 Kilometres of bicycle paths and lanes per 100 000 population

7.40.1 General

This indicator is derived from ISO 37120:2018, 19.4.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.40.2 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 1/100 000 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.

7.41 Annual number of public transport trips per capita

(This indicator is derived from ISO 37120:2018, 19.2)

7.41.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator has been placed under the "environment" domain as it fulfils the understanding of the "… impact of infrastructure on the climate and natural environment" element of "environment" as described in Clause 5. However, indicators under the ESG framework can have relationships to one or more thematic domains, and local context should be applied when considering indicator application.

NOTE 2 Transport usage is a key indicator of how easy it is to travel in the city by modes other than SOVs. The indicator can 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.

7.41.2 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. Only transit open to the entire population shall be considered. For example, specialized transit exclusively for elderly persons or persons with disabilities (paratransit) shall not be included.

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.

7.41.3 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 Fare machine 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, many 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.

7.42 Annual number of public transit trips on vehicles designated for accessible transit (paratransit) per capita

7.42.1 General

This indicator shall be reported in accordance with the following requirements.

7.42.2 Indicator requirements

Annual number of public transit trips on vehicles designated for accessible transit (paratransit) per capita shall be calculated as the total annual number of public transit trips on vehicles designated for paratransit owned/operated by a level of government (e.g. city, region, state, province, country) (numerator) divided by the total city population (denominator). The result shall be expressed as the annual number of public transit trips on vehicles designated for paratransit per capita.

Vehicles designated only for accessible transit (paratransit vehicles) refer to specialised transportation services for persons with disabilities. Vehicles must be designated as part of the accessible transit/paratransit fleet. This can include, but is not limited to, vehicles with accessibility features such as wheelchair lifts/ramps/straps, stop request controls, interior handrails, audio and visual announcements, and slip resistant low glare floors. These vehicles can be accessible vans, buses, and individual vehicles such as taxi services contracted by the government provider.

Only services owned/operated by a level of government (e.g. city, region, state, province, country) in the city shall be counted. Subsidised rides through ridesharing programs or taxi services not contracted by the government provider shall not be counted. Vehicles must be part of the paratransit fleet or operated under agreement with the accessible transit provider.

Trips on conventional transit systems that are also accessible shall not be counted. For example, subway cars meeting accessibility standards or wheelchair accessible buses that are part of the regular fleet should not be included. Vehicles must only serve passengers with accessibility needs.

Trips refer to one-way trips with origins in the city.

7.43 Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods

7.43.1 General

This indicator is derived from ISO 37120:2018, 19.6.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.43.2 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 differ by region and municipality. Municipalities shall choose and maintain data on two 3-h periods.

7.43.3 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 geoprocessing. 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.

7.44 Number of bicycles available through municipally provided bicycle-sharing services per 100 000 population

7.44.1 General

This indicator is derived from ISO 37122:2019, 19.4.

This indicator shall be reported in accordance with the following requirements.

NOTE Bicycle sharing or a bike-share scheme is a service in which bicycles are made available for shared use to individuals on a short-term basis. Generally, individuals can borrow and return the bike at different locations. Bicycle sharing promotes greater rates of bicycle use in cities by reducing traditional barriers to ridership, including costs, bicycle theft and repair. Bicycle sharing provides an alternative to traditional transportation modes such as public transit or private automobiles. This indicator provides municipalities with a measure of the availability of bicycles in the bicycle share system.

7.44.2 Indicator requirements

The number of bicycles available through municipally provided bicycle-sharing services per 100 000 population shall be calculated as the total number of bicycles available through municipally provided bicycle-sharing services in the city (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the number of bicycles available through municipally provided bicycle-sharing services per 100 000 population.

Bicycle-sharing services shall refer to a bicycle sharing system with bicycles available through self-serve docking stations, or person-operated docking stations, located throughout a city, where bicycles can be rented as needed. Users should be able to rent and return bicycles to any docking station within the bicycle-sharing system. Municipally provided bicycle-sharing services shall refer to bicycle-sharing services funded

and operated by the city. This should also include bicycle-sharing services operated under public private partnerships.

7.44.3 Data sources

Data on the number of bicycles available through bicycle-sharing services in the city should be sourced from relevant city departments that either oversee or collect data on bicycle shares, or both.

7.45 Percentage of the city's population living within one km of a grocery store

7.45.1 General

This indicator is derived from ISO 37123:2019, 20.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 1 Proximity to good quality and affordable food is a challenge for many city residents. Nearby grocery stores can provide access to good quality and affordable food, which improves the health, productivity and general prosperity of city residents, as well as the overall resilience of a city.

NOTE 2 In addition, residents living in close proximity to grocery stores tend to have greater food security relative to those residents living further away from grocery stores, as these residents living in close proximity to grocery stores can travel to obtain food more efficiently. In addition, establishing grocery stores in closer proximity to residents decentralizes food supply, providing more grocery shopping options for residents across a city and ultimately ensuring the ease of access to food options for residents in a city.

7.45.2 Indicator requirements

The percentage of the city's population living within one km of a grocery store shall be calculated as the number of people in the city that live within one km of a grocery store (numerator) divided by the city's total population (denominator). The result shall be multiplied by 100 and expressed as the percentage of the city's population living more than one km from a grocery store.

A grocery store shall refer to a retail shop that primarily sells food.

7.45.3 Data sources

Data on the number of people living within one km of a grocery store should be sourced from surveys and by the use of GIS mapping tools.

7.46 Compliance rate of drinking water quality

7.46.1 General

This indicator is derived from ISO 37120:2018, 23.4.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

7.46.2 Indicator requirements

Compliance rate of drinking water quality shall be calculated as the sum of the number of compliant tests (numerator) divided by the number of treated water quality tests carried out (denominator). The result shall be multiplied by 100 and expressed as the compliance rate of drinking water.

Compliant tests to be considered are aesthetic, microbiological, physical, chemical and radioactivity tests. Tests not required by the city or relevant authority should not be included toward the numerator or denominator.

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.

7.47 Percentage of city population that can be supplied with drinking water by alternative methods for the first 72 h of an emergency

7.47.1 General

This indicator is derived from ISO 37123:2019, 23.2.

This indicator shall be reported in accordance with the following requirements.

NOTE Providing drinking water is critically important to the response efforts for a disaster event. It is important that city water providers and local governments ensure effective planning for alternative (i.e. backup) drinking water supply methods during and immediately after a disaster event or system disruption. It is important that contingency plans are established in order to identify how drinking water will be distributed in the case of such a disruption. Back-up supplies are especially important to serve vulnerable populations.

7.47.2 Indicator requirements

The percentage of city population that can be supplied with drinking water by alternative methods for 72 h shall be calculated as the number of people in the city who can be supplied with drinking water by alternative methods for 72 h (numerator) divided by the total city population (denominator). The result shall be multiplied by 100 and expressed as the percentage of city population that can be supplied with drinking water by alternative methods for 72 h.

Alternative methods of water supply shall include emergency water tankers, bottled water and rainwater harvesting.

7.47.3 Data sources

The data for this indicator should be sourced from the emergency management department of the city, water system operators and/or appropriate regulatory authorities.

7.48 Social profile indicators

7.48.1 Number of persons per dwelling unit

7.48.1.1 General

This indicator is derived from ISO 37120:2018, 12.5.2.

This indicator shall be reported in accordance with the following requirements.

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

7.48.1.2 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 occupied 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

7.48.2 Vacancy rate (residential)

7.48.2.1 General

This indicator is derived from ISO 37120:2018, 12.5.3.

This indicator shall be reported 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.

7.48.2.2 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).

7.48.2.3 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.

7.48.3 Secondary residence rate

7.48.3.1 General

This indicator is derived from ISO 37120:2018, 12.5.5.

This indicator shall be reported 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.

7.48.3.2 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.

7.48.4 Percentage of foreign born population

7.48.4.1 General

This indicator is derived from ISO 37120:2018, 13.4.2.

This indicator shall be reported in accordance with the following requirements.

NOTE Immigrant populations 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.

7.48.4.2 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 parents born in the country.

7.48.5 Population demographics

7.48.5.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 13.4.3 with some methodological adjustment.

NOTE 2 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.

Population groups can vary by country. Local context should be considered when applying this indicator.

7.48.5.2 Profile indicator requirements

The percentage of the population for each age category shall be calculated and recorded in Table 16, while the male to female ratio and population dependency ratio is recorded in Table 17.

Table 16 — Population by age category and gender

	Male	Female	Total
Percentage of population that are children (aged 0 to 14 years)			
Percentage of population that are youths (aged 15 years to 24 years)			
Percentage of popula-tion that are adults (aged 25 years to 64 years)			
Percentage of population that are senior citizens (aged ≥ 65 years)			
Total population			

Table 17 — Male to female ratio and population dependency ratio

	Value
Male to female ratio	
Population dependency ratio	

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

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

The male to female ratio shall be calculated as the total number of males (numerator) divided by the total number of females (denominator) multiplied by 100.

7.48.6 Percentage of new immigrant population

7.48.6.1 General

This indicator is derived from ISO 37120:2018, 13.4.4.

This indicator shall be reported in accordance with the following requirements.

NOTE Immigrant populations 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.

7.48.6.2 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.

7.48.7 Percentage of non-citizen population

7.48.7.1 General

This indicator is derived from ISO 37120:2018, 13.4.5.

This indicator shall be reported 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 can 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.

7.48.7.2 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 do not necessarily reside in the city permanently. Non-citizens can include people who are temporarily in the city for employment contracts or to pursue education.

NOTE The specific definition per country varies slightly.

7.48.8 Number of university and college students per 100 000 population

7.48.8.1 General

This indicator is derived from ISO 37120:2018, 13.4.6.

This indicator shall be reported in accordance with the following requirements.

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

7.48.8.2 Profile indicator requirements

The number of university and college students per 100 000 population shall be calculated as the total number of full- and part-time university and college students (numerator) divided by 1/100 000 of the city population (denominator). The result shall be expressed as the number of university and college 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.

College students shall refer to students attending a degree granting tertiary education institution that is not a university.

Only students registered at institutions within the city administrative boundary shall be considered.

7.48.9 Annual number of deaths in the city resulting from legal intervention

7.48.9.1 General

This indicator shall be reported in accordance with the following requirements.

7.48.9.2 Profile indicator requirements

The annual number of deaths in the city resulting from legal intervention shall be calculated as the annual number of deaths in the city resulting from legal intervention.

Deaths resulting from legal intervention in the city refers to those inflicted by the police or other law-enforcing agents, including all federal, regional, municipal and military police officers in the course of arresting or attempting to arrest lawbreakers, suppressing disturbances, maintaining order, and other legal action. Cause of death should be reported according to the ICD-10 [163]. Fatalities consistent with the ICD-10 codes Y35.0-35.4, Y35.6, Y35.7, and Y89.0 for "legal intervention" shall be counted.

Deaths coded otherwise but with circumstances as described in fields of the death certificates or medical examiner investigation consistent with the above definition shall be included.

NOTE Deaths resulting from legal intervention are often unreported, under-reported, or mis-classified in many cities, and official registration of deaths resulting from legal intervention can be under-represented.

8 Governance indicators

8.1 Survival rate of new businesses

8.1.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37122:2019, 5.2 with some methodological adjustment.

NOTE 2 New businesses make a positive contribution to local economies, and start-up activity can signal a city's economic potential. New businesses can potentially contribute a substantial number of new jobs to the economy and tend to have faster employment growth rates, especially those in innovation-driven/technologically focused enterprises, such as computer or software development.

8.1.2 Indicator requirements

The survival rate of new businesses shall be calculated as the number of businesses in the city created two years ago still in operation (numerator) divided by the total number of businesses in the city created two years ago (denominator). The result shall be expressed as the survival rate of new businesses. Businesses shall refer to companies or enterprises in the city.

These businesses can be considered to have either innovative business processes or products, or both. Cities reporting on this indicator shall specify the sectors and categories of innovative businesses that are included in this calculation. The enterprise is the smallest combination of legal unit, which is an organisational unit producing goods or services. Business can either be categorised as simple (one operating entity) or complex (multiple operating entities) as stated in ISO 37120:2018, 5.5.2. An innovative business refers to a business that is implementing new ideas, creating dynamic products or improving existing services in any industry.

8.1.3 Data sources

Data on new businesses should be obtained through relevant city departments or ministries that oversee the approval of new business licenses or new registrations of businesses.

8.2 Percentage of city owned/operated properties with insurance coverage for high-risk hazards

8.2.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37123:2019, 5.3 with some methodological adjustment.

NOTE 2 Widespread insurance coverage within cities represents a crucial component of resilience due to the critical role that insurance plays in a city to rapidly recover from shocks and stresses. Insurance improves economic and fiscal outcomes through several channels. Before a disaster strikes, the pricing of insurance gives policyholders incentives to reduce their exposures through risk mitigation measures. In the aftermath of disaster, insurance transfers the fiscal burden away from taxpayers or to the private sector and into capital markets. It also limits financial contagion by restoring supply chains and stalled business operations faster, while providing needed liquidity and certainty in business and financial planning.

8.2.2 Indicator requirements

The percentage of city owned/operated properties with insurance coverage for high-risk hazards shall be calculated as the total number of city owned/operated properties within the city with insurance coverage for high-risk hazards affecting the city (numerator) divided by the total number of city owned/operated properties in the city (denominator). The result shall be multiplied by 100 and expressed as the percentage of city owned/operated properties with insurance coverage for high-risk hazards.

City owned/operated properties shall refer to properties that are owned or operated by the city.

Hazards are defined in 3.8.

For the purposes of this indicator, high-risk hazards shall refer to hazards for which there is a likelihood of extreme event(s) based on hazard maps created by the city that can either significantly affect many properties in the city or have a major impact on the city, or both (see 3.11).

8.2.3 Data sources

Insurance data should be sourced from city government departments.

8.2.4 Data interpretation

Two key elements when considering insurance coverage for resilience are the amount of damage sustained and the speed of recovery.

8.3 Number of science, technology, engineering, and mathematics (STEM) higher education degrees per 100 000 population

8.3.1 General

This indicator is derived from ISO 37122:2019, 6.3.

This indicator shall be reported in accordance with the following requirements.

NOTE Receiving higher education provides individuals with a foundation for meaningful participation in the labour force and helps reduce poverty and inequality. This pillar of human development is widely recognized as the main avenue for social mobility. All disciplines taught by higher education institutions benefit society in some way, such as STEM disciplines, which are critical to the technological development and innovation of a city. STEM education helps to create critical thinkers, increase science literacy, and enable the next generation of innovators. Furthermore, STEM is important because science pervades every part of our lives, and the need for STEM degree holders is increasing with the growing demand for innovators of products and processes that will help sustain and promote economic growth.

8.3.2 Indicator requirements

The number of STEM higher education degrees per 100 000 population shall be calculated as the number of people holding higher education degrees with a specialization or major in a discipline within a STEM subject (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the number of STEM higher education degrees per 100 000 population.

STEM higher education degrees shall refer to higher education degrees specializing in subjects within the fields of science, technology, engineering, and mathematics, and is intended to capture a broad field of education and employment opportunities, beyond the narrower fields of science and mathematics. STEM programmes of study are typically classified based upon several occupational clusters: computer science and technology; mathematical sciences; digital music and digital arts, engineering, and surveying; and natural, physical and life sciences.

This indicator shall only include people who comprise the city's total population and shall not include temporary residents or international students. Higher education shall refer to the definition of tertiary education stated in 3.24.

8.3.3 Data sources

Data on higher education degrees by subject should be sourced from local tertiary/postsecondary degree-, diploma- or certificate-granting institutions, or the relevant Ministry or Department of Education, if available. If higher education data from these sources are not available, data from surveys or censuses can be used.

8.3.4 Data interpretation

This indicator provides an overview of the skill set of the population. These data can also have an impact on surrounding cities because the population with STEM degrees can work in those cities or, in other contexts, can force lower educated people to move to surrounding cities, creating intellectual ghettos in the city. Although only STEM disciplines are considered for this indicator, social science and other disciplines are also important for the city's labour force and can contribute to the smartness of the city.

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

8.4.1 General

This indicator is derived from ISO 37120:2018, 9.1.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

8.4.2 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.

8.4.3 Data interpretation

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

Care should be taken when evaluating this indicator. A high debt service ratio can indicate a city that has taken on too much debt, but it can 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 can indicate a city is strong financially and can finance most capital projects through alternative funding sources. It can also indicate that a city is financially weaker and has deferred capital projects and allowed important infrastructure to deteriorate.

8.5 Capital spending as a percentage of total expenditures

8.5.1 General

This indicator is derived from ISO 37120:2018, 9.2.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

8.5.2 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 new projects and repair/maintenance of existing capital such as transit, roads, bridges, public buildings, and infrastructure.

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

8.5.3 Data sources

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

8.5.4 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 can reflect the city's financial capacity to invest in capital items needed to support future growth and development.

8.6 Annual direct or in-kind city expenditure on research and development funding and grants as a percentage of total city expenditures

8.6.1 General

This indicator shall be reported in accordance with the following requirements.

8.6.2 Indicator requirements

The annual direct or in-kind city expenditure on research and development funding and grants as a percentage of total city expenditures shall be calculated as the annual direct or in-kind city expenditure on research and development funding and grants (numerator) divided by the city's total annual expenditures (denominator). The result shall then be multiplied by 100 and expressed as the annual direct or in-kind city expenditure on research and development funding and grants as a percentage of total city expenditures.

Research and development refer to creative and systematic work undertaken in order to increase the stock of knowledge and should be aimed at new/novel findings and based on original concepts.

Research and development involves conducting original investigation, undertaken on a systematic basis to gain new knowledge (research), and in the application of research findings or other scientific knowledge for the creation of new or significantly improved products or processes (experimental development). These activities fall within ISIC, Division 72 [144].

Funding and grants can be directed at organizations within the research and development field but can also include other organizations. Research and development funding and grants refer to city expenditures on activities external to the city (not city owned or operated activities or entities). Grants to activities or entities owned or operated by the city shall be excluded.

ISIC [144] should be used to define the research and development sectors.

Table 18 should be used when possible, to provide additional context:

Table 18 — Number of projects city involved with and associated value

Type of city involvement	Number of projects city involved with	Expenditure amount (USD)
Direct		
In-kind		

8.7 Annual expenditure on invasive or alien species monitoring and control as a percentage of total city expenditures

8.7.1 General

This indicator shall be reported in accordance with the following requirements.

8.7.2 Indicator requirements

Annual expenditure on invasive species monitoring and control as a percentage of total city expenditure shall be calculated as the total annual expenditure on invasive or alien species monitoring and control (numerator) divided by the total annual city expenditures (denominator). The result shall be multiplied by 100 and expressed as the annual city expenditure on invasive or alien species monitoring and control as a percentage of total city expenditures.

Invasive or alien species are species that have been introduced outside their natural past or present distribution through human action. Invasive or alien species are alien species that are harmful and whose introduction or spread threatens the environment, the economy or society, including human health.

City expenditure on invasive or alien species monitoring and control can include, but is not limited to: expenditure on prevention, detection, control and management, habitat restoration, and research and science activities. Where possible, expenditure data by activity (e.g. habitat restoration, detection) should be provided.

8.8 Annual expenditure on upgrades and maintenance of city service assets as a percentage of total city expenditures

8.8.1 General

This indicator is derived from ISO 37123:2019, 9.1.

This indicator shall be reported in accordance with the following requirements.

NOTE Upgrading and maintenance of city service assets helps to ensure sound budget planning and management as well as a more resilient city. If the assets to provide these services are not either maintained or upgraded, or both, the level of service over time is likely to decline and to be more vulnerable to disruption during shocks and stresses. Proactively maintaining and upgrading basic services ensures public safety and provides adequacy for the future.

8.8.2 Indicator requirements

Annual expenditure on maintenance and upgrades of city service assets as a percentage of total city expenditures shall be calculated as the annual total of expenditures on maintenance and upgrades of assets for the provision of city services (numerator) divided by the total annual expenditures of the city (denominator). The result shall be multiplied by 100 and expressed as the annual expenditure on maintenance and upgrades of city service assets as a percentage of total city expenditures.

City service assets vary in each city, but usually include, but are not limited to, roads, streetlighting infrastructure, sanitation infrastructure, water infrastructure, public transportation infrastructure.

8.9 Annual expenditure on upgrades and maintenance of storm water infrastructure as a percentage of total city expenditures

8.9.1 General

This indicator is derived from ISO 37123:2019, 9.2.

This indicator shall be reported in accordance with the following requirements.

NOTE Protective storm water infrastructure is critical to mitigate hazards and potential impacts of extreme precipitation events. Proactively maintaining, upgrading, and managing helps to ensure public safety, and adequacy for the future.

8.9.2 Indicator requirements

Annual expenditure on upgrades and maintenance of storm water infrastructure as a percentage of total city expenditures shall be calculated as the annual total of all funds spent on upgrades and maintenance of storm water physical and management infrastructure (numerator) divided by the total annual expenditures of the city (denominator). The result shall be multiplied by 100 and expressed as the expenditure on upgrades and maintenance of storm water infrastructure as a percentage of total city expenditures.

Storm water infrastructure shall refer to facilities and technical and organizational structures that are designed, installed and/or maintained to mitigate the effects of rainwater and snowmelt hazards in urban areas. Examples of storm water infrastructure include: levees and flood barriers; flood basins; sea walls; storm drains and storm water holding tanks; storm water ditches, culverts, and catchment basins. Capital expenditure on new projects shall be excluded.

8.9.3 Data sources

Information on expenditures should be sourced from capital and maintenance expenditures documents which are approved annually.

8.10 Voter participation in last municipal election (as a percentage of registered voters)

8.10.1 General

This indicator is derived from ISO 37120:2018, 10.4.

This indicator shall be reported in accordance with the following requirements.

NOTE 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.

In some countries and cities, you can vote without registering or you are automatically registered. This should be considered.

8.10.2 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.

The number of 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 other countries, eligible and registered voters are one and the same. Cities shall note whether citizens eligible to vote or (actively) registered to vote have been reported.

8.10.3 Data sources

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

8.10.4 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 means 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 % can reflect voting that is mandatory in the local election.

8.11 Percentage of female elected city-level officers

8.11.1 General

This indicator shall be reported in accordance with the following requirements.

NOTE 1 This indicator is derived from ISO 37120:2018, 10.1 with some methodological adjustment.

NOTE 2 The percentage of women elected to city-level office is a direct reflection of inclusiveness in governance.

8.11.2 Core indicator requirements

Women as a percentage of the 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.

Elected officials shall refer to councillors or their equivalents.

8.12 Annual number of online engagements with the municipal open data portal per 100 000 population

8.12.1 General

This indicator is derived from ISO 37122:2019, 10.1 with some methodological adjustment.

This indicator shall be reported in accordance with the following requirements.

NOTE Open data portals provide a means of increasing public access to data managed by municipalities. It creates greater transparency and allows for innovation by community organisations and citizens. Although many municipalities offer online portals, not all are equally visited.

8.12.2 Indicator requirements

The annual number of online engagements with the municipal open data portal per 100 000 population shall be calculated as the total number of engagements with the municipal open data portal (numerator) divided by 1/100 000 of the city's total population (denominator). The result shall be expressed as the annual number of online engagements with the municipal open data portal per 100 000 population.

An open data portal shall refer to a data portal operated by the city and providing access to open data. Open data shall refer to structured, machine-readable and freely shared data that can be used and built upon without restrictions. Data should be downloadable for citizens and other users such as developers.

Online engagements shall include both online visits and downloads of datasets.

An online visit shall refer to an individual visitor who arrives at the city's open data portal online and proceeds to browse and peruse the open data portal. A visit counts all visitors, no matter how many times the same visitor has been to the open data portal.

A download of a dataset shall refer to the process of someone transferring a dataset from the online portal to their own computer.

The number of engagements with the municipal data portal should be reported by type in Table 19.