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**Sustainable cities and communities —  
Management requirements and  
recommendations for open data for  
smart cities and communities —  
Overview and general principles**

*Villes et communautés territoriales durables — Exigences et  
recommandations en matière de gestion des données ouvertes pour  
les villes et communautés territoriales intelligentes — Vue d'ensemble  
et principes généraux*

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## Foreword

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

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

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

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

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

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

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

## Introduction

The public sector is one of the most data-intensive sectors, as it generates as well as consumes, a huge amount of public service information on a regular basis. Besides the need for transparency, the openness of this data can contribute to the planned growth of cities, the development of technological municipal infrastructure, improved governance, and overcoming societal challenges. Many countries have established an online platform that discloses data collected by public sectors. Such 'open data' is freely available data that can be accessed, used, re-used, distributed, and re-distributed by any process of interest, without any restriction or limitation. Open data are part of an open government that makes accountable, responsive and inclusive governance. Open data are part of the development of a data and platform economy and favour greater integration and infrastructure connectivity.

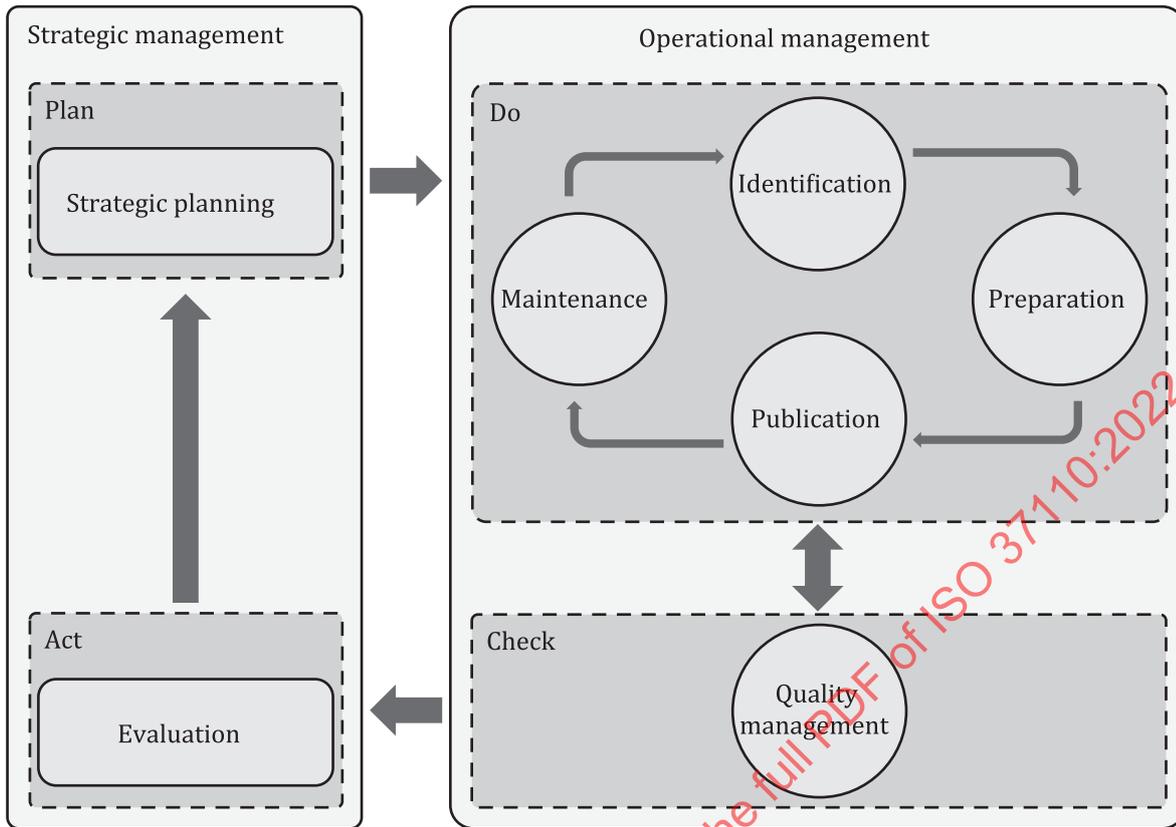
In this context, public sector bodies have realized not only the value and importance of the data they hold in their registers, databases and IT systems, but also understand that these data should be set free as far as possible. Open data in smart cities can include rapid velocity of real-time data in large volumes, as well as publishing and connecting structured data sets, such as linked data, within the infrastructure of all cities, which can be accessible via online analysis, source files, online visualization and Application Programming Interfaces (APIs).

For sustainable cities and communities, especially developed and managed under requirements specified in ISO 37101, adaptation and utilization of open data is expected to enhance smartness, resiliency, transparency, accountability and sustainability, by fostering business creation and development of solutions for the city, as well as creating a new value or benefiting people and stakeholders within. Open data can improve quality and speed of preparation of plans and infrastructure projects for the city.

However, despite the benefit of use and necessity of open data, there is not enough information or standards in the management of open data to be utilized in sustainable cities and communities.

Therefore, for those who are involved in the management process of open data, it is necessary to define the management framework of open data in terms of management processes, e.g. strategic planning, evaluation, identification, preparation, publication, maintenance, and quality management.

The primary audience for this document is officials in cities and the public sector, researchers, research institutions and civil society organizations. Secondary audiences can be those who are in the private sector, including non- or for-profit organizations.



**Figure 1 — Plan-Do-Check-Act (PDCA) model of open data management**

These management processes are based on the Plan-Do-Check-Act (PDCA) model (Figure 1) and the processes are described and mapped as follows:

- Plan: strategic planning process, involving end-user and cross-sector and cross-jurisdictional knowledge, that defines problems and goals to achieve;
- Do: identification, preparation, publication, and maintenance of open data to achieve predefined goals;
- Check: quality management process that monitors and measures other processes against predefined operational rules and lawful regulations and reports to the necessary processes and partnerships to act on the results;
- Act: evaluation process that recommends necessary actions to integrated planning process to improve overall usage and management performance of open data.

# Sustainable cities and communities — Management requirements and recommendations for open data for smart cities and communities — Overview and general principles

## 1 Scope

This document provides an overview and general principles, including requirements and recommendations, for open data management for sustainable cities and communities. It is intended to be used as a base document for open data management framework standards.

## 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

#### open data

data available without restrictions from copyright, patents or other mechanisms of control or costs, regardless of access, or use

Note 1 to entry: “without restrictions” does not mean that there is no copyright, patents or ownership of the data, simply that users of the data are able to make use of the data under license terms that make clear that there are no restrictions on that use, other than potentially a requirement to attribute the source of the data.

Note 2 to entry: “regardless of access, or use” means that it has universal participation and it is available to use, re-use and redistribute for any purpose, as long as the integrity of its opening and origin is preserved.

[SOURCE: ISO/TR 21797:2019, 3.5, Notes 1 and 2 to entry have been added.]

## 4 Overview of open data

### 4.1 Purpose of open data

Open data is freely available data that can be accessed, used, re-used, distributed, and re-distributed by any process of interest, without any restriction or limitation.

The purpose of making data open is to create a new value or benefit to the dataset’s originator and different groups of people and organizations.

In most cases, prospective open data is collected and managed by government agencies or the public sector. The main beneficiaries of open government data in cities are citizens, as well as the public sector, civil society organizations, researchers and research institutions and the private sector, including start-up companies.

Examples of possible new values and benefits of open data are:

- to improve transparency by enabling open government;
- to improve or create new value to public/private services;
- to improve efficiency of public/private services;
- to improve effectiveness of public/private services;
- to add new value to public/private services;
- to improve quality of public/private services;
- to inform public policy development to create, discard, or modify public policies.

For open data, owners of data or copyright are mostly government agencies or the public sector. However, if the dataset is owned by processes other than the ones mentioned, the owner shall provide license such that the data subject to be opened can be used freely or at a fee that does not exceed the cost under the usage guidelines of open data.

## 4.2 Characteristics of open data

### 4.2.1 General

This subclause lists and describes characteristics of open data that are necessary to be considered when designing an open data management framework.

### 4.2.2 Availability

Open data shall be available in a digitally modifiable form. If there is analogue data subject to be opened, it shall be transformed into a digitally modifiable form.

### 4.2.3 Accessibility

Open data shall be conveniently accessible online and if possible, if required offline, as a whole or a part. On-line accessibility means that the dataset is accessible via World Wide Web (internet) using URIs and URLs that are validated regularly.

### 4.2.4 Cost

The basic principle of open data is that the dataset shall be available free of charge. However, depending on the license, the copyright owner may charge usage fee that does not exceed the cost.

### 4.2.5 Copyright

Use of open data shall not infringe copyright.

### 4.2.6 Distribution

Open data shall be distributed or redistributed online to any process of interest at any time. Offline distribution is subject to an agreement.

### 4.2.7 Informative metadata

While all open data has potential value, in order to promote its effective usage, each open data dataset should be accompanied by informative metadata. The metadata should include sufficient detail about when and how it was collected, its accuracy and provenance to enable potential users to evaluate its appropriateness for their purpose.

#### 4.2.8 Integrity

Open data shall not be altered or destroyed in an unauthorized manner.

#### 4.2.9 Interoperability

The open dataset shall provide capabilities to support seamless interoperability with other datasets, capabilities such as use of appropriate open formats, unique identifiers, data schema and APIs.

#### 4.2.10 License

The copyright owner of the dataset shall provide license terms which describes cost, usage rules and any other information that a user shall follow. This should use plain language, and ideally re-use well-established and widely used license models such as Creative Commons licenses.

#### 4.2.11 Ownership

If open data is used to create a new dataset, ownership shall be determined based on the license or under the laws and regulations.

#### 4.2.12 Privacy

Data that can invade the privacy of an individual or a group in any form shall be excluded or anonymized in order to respect local data protection regulations. If a dataset has the possibility to invade privacy, the dataset shall not be opened, even if it was created with open data. Both the owner and the user of open data have the responsibility to check the possibilities of invasion of privacy.

#### 4.2.13 Restriction or limitation

Open data shall have no restriction or limitation of any kind, in access, usage, and distribution, within the boundaries of local laws and regulations that the copyright or owner of dataset abides by. However, the dataset shall not be opened to the processes if they cannot be controlled by the laws and regulations.

#### 4.2.14 Security

Data that can threaten security of any kind shall be excluded.

#### 4.2.15 Stakeholder

Stakeholders of open data are inclusive of, but not limited to, the general public, government agencies, and non-profit sectors, for-profit sectors represented by companies and start-ups.

#### 4.2.16 Usability

Use of open data shall be seamless and effortless. Use of datasets is enhanced by allowing access through readily available web browsers, tags, search engine optimisation, links and formats that are effectively and efficiently opened and reviewed in open source software packages.

## 5 Open data management

### 5.1 General management model

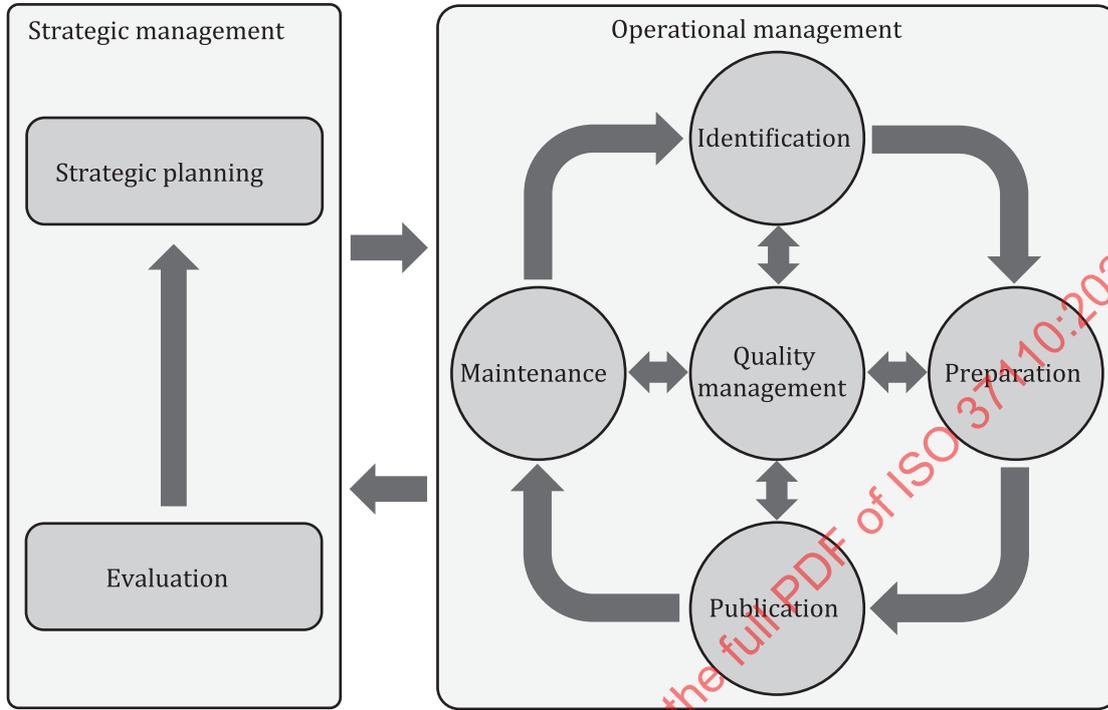


Figure 2 — General management model

The general management model of open data illustrated in [Figure 2](#) is classified into two parts: strategic management and operational management. The strategic management consists of strategic planning processes and evaluation processes, whereas the data management part consists of identification, preparation, publication, maintenance and quality management processes.

### 5.2 Strategic management

#### 5.2.1 Strategic planning

The strategic planning process is the first step of use and management of open data. The objective of this process is to:

- provide infrastructure and tools in order to have data from cities that is easily accessible, organized, and easy to understand;
- develop guidelines to define, use and manage open data;
- ensure stakeholder engagement with civic agencies, data owners and all members of the data-using community.

In developing the guidelines, the process defines:

- the current situation and problems to be solved;
- stakeholder needs;
- the objectives and the key measurable goals;
- requirements, rules, and lawful regulations to abide by;

- evaluation criteria and indicators;
- timeline of each process and expiration of data;
- other necessary items to implement open data.

The planning process utilizes feedback reports from the evaluation process to continuously update what had been defined before, e.g. problems, goals, requirements, and evaluation criteria.

### 5.2.2 Evaluation

The main purpose of the evaluation is to send feedback to the strategic planning process based on the reports from the quality management process in operational management.

For proper evaluation and feedback, the process should:

- develop detailed indicators to evaluate all processes based on the evaluation criteria and indicators defined by the planning process;
- monitor and evaluate each process based on the reports from the quality management process;
- evaluate and generate a statistical usage report of open data;
- generate and forward reports to the planning process.

## 5.3 Operational management

### 5.3.1 Identification

The identification process identifies and lists datasets to use based on the operational guidelines defined by the strategic planning process.

Key operations of this process include:

- identifying target datasets;
- identifying (whenever possible) trustworthy data repositories committed to long term preservation, aligned with Findable, Accessible, Interoperable, and Reusable (FAIR) principals;
- checking for usage clearance, e.g. accessibility, privacy, security, and proprietary violation issues;
- reporting to the quality management process if a problem is found.

### 5.3.2 Preparation

Unless the identified dataset can be published and used without any action, a dataset should be prepared such that it can be published and used following the usage guideline defined by the strategic planning process.

The actions taken by the process to create a new dataset and the possible actions are:

- extraction of partial data;
- modification of data values;
- documentation of methodologies used to define and construct data, data cleaning, data imputation and data provenance;
- mapping attributes and values onto urban data standards, where available and relevant;
- merging and mashing up of data from different data sources;