INTERNATIONAL STANDARD

ISO 37170

First edition
2022-12

Smart community infrastructures — Data framework for infrastructure governance based on digital technology in smart cities

Infrastructures urbaines intelligentes — Cadre de données pour la gouvernance des infrastructures fondée sur la technologie numérique dans les villes intelligentes

Reference number
ISO 37170:2022(E)

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Published in Switzerland

Contents

Page

Foreword

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This document was prepared by Technical Committee ISO/TC 268, *Sustainable cities and communities,* Subcommittee SC 1, *Smart community infrastructures*.

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

With more than half of the world's population living in cities, the city is the place where resources and economic and social activities are concentrated. As a space carrier for human beings in economic, social, cultural, and political activities, the city has become a source of technological innovation, an engine of economic growth, a platform for cultural development, a centre for decision-making, and a node for external connections. In the context of globalization, the city has become increasingly important. However, poor management of the city causes states of confusion and disorder, e.g. traffic congestion, environmental pollution, shortage and waste of resources, which is incompatible with sustainable development and the UN Millennium Development Goals.

City infrastructures are the foundation of city operations and the goal of city management, including municipal infrastructures, information and communications technology (ICT) infrastructures (see ISO/TR 37150). Information and digital technologies, e.g. mobile Internet, Internet of Things, and systems integration, provide a fundamental basis for infrastructure management. Based on digital technologies and systems, the digital city management framework can be expanded by integrating information, ICT and public facilities and services. Meanwhile, the city management database can be constructed by adopting various data bases from existing city data sources, e.g. environmental monitoring, traffic monitoring, energy supply, and demographic statistics. The collection and integration of various factors of city management will improve the data standardization and promote collaboration across departments and businesses. This can improve the service capabilities of city infrastructures and contribute to improving processes and services that facilitate and support liveability within the city. The specific practices of infrastructure governance will depend on the characteristics and actual demands of the city and considering protection of data privacy, public participation, the sovereignty of data.

This document provides a unified data framework of city infrastructure governance, underpinned by management and applications, security and privacy principles. This document is a reference for stakeholders and provides a data framework and system structures, which help city governments, enterprises, organizations and individuals participate in city activities and infrastructure governance.

NOTE Annex A outlines useful case studies of data framework for digital governance of infrastructure in smart cities.

Smart community infrastructures — Data framework for infrastructure governance based on digital technology in smart cities

1 Scope

This document provides a framework for the application of digital technologies in smart community infrastructures to improve the capacity of digital governance of infrastructure.

This framework is applicable to infrastructure governance in smart cities and is intended to be a basic data framework for infrastructure governance. It can establish the basis for future standardization of smart city infrastructures and can be further applied in other aspects of city management.

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
data framework
structure of processes and specifications designed to support the collection, transmission, organization and use of data to applied services

3.2
digital governance of infrastructure
activity that is coordinated and implemented by a set of activities aimed to design, implement and monitor a strategic plan for city infrastructure and its data management through, e.g. the Internet of Things (IoT), cloud computing, mobile Internet, geospatial information, big data and other new-generation information technologies, to realize efficient management of city infrastructure

Note 1 to entry: Governance of data is described in ISO/IEC 38505-1.

Note 2 to entry: Digital governance includes (but is not limited to) digital strategy, digital policies, digital standards, digital processes, digital procedures, digital roles and digital control tools, put in place to meet regulatory, legal, risk and operational requirements.

3.3
component
part of a system delimited according to structural or functional aspects, which can still implement independent sub-functions

EXAMPLE Municipal engineering facilities, transportation facilities, amenity and environment facilities, landscaping facilities and other facilities are component of city infrastructure.

[SOURCE: ISO 20890-4:2020, 3.10, modified — The EXAMPLE has been added.]

3.4
event
occurrence, which may have an effect on the outcome of a measurement or inspection operation and which should be recorded

Note 1 to entry: Phenomena and behaviour caused by human or natural factors need to be dealt with by an urban management department and restored to normal, such as *components* (3.3), urban appearance, environment and environmental order, to be affected or destroyed.

[SOURCE: ISO 23952:2020, 3.4.57, modified — Note 1 to entry has been added.]

3.5
city unit grid
division of jurisdictional areas based on a city scale, administrative divisions and population distribution

Note 1 to entry: City unit grid can provide basic geographical data as digital control tools for digital governance.

4 General

The data framework for digital governance of infrastructure in a smart city is made up of three parts: application, platform and database, as illustrated in Figure 1.

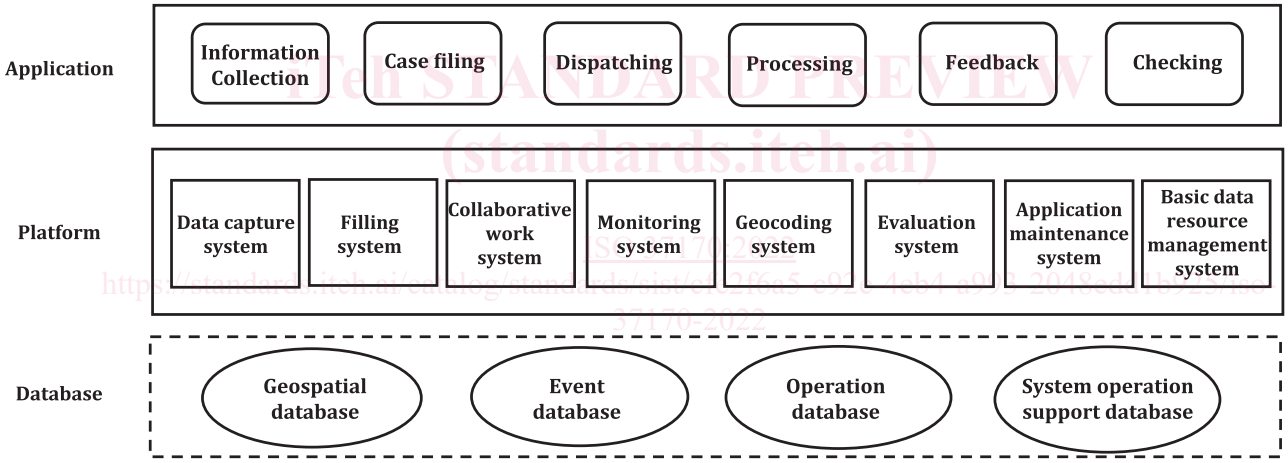

Figure 1 — Scheme of data framework for digital governance of infrastructure in a smart city

As shown in Figure 1, to meet the needs of digital city management, the data framework contains the following parts to ensure effective operation:

a) To support the data platform, databases (including geospatial databases, event databases, operation databases and system operation support databases) are introduced. The details are described in Clause 5.

b) To enable the digital processing of the application, the data platform is introduced and formed by different systems to provide close-loop information management for comprehensive municipal cases. The details are described in Clause 6.

c) As the application of the data framework, the main process of digital governance of infrastructure in a smart city can be achieved in six steps: information collection, case filing, dispatching, processing, feedback and checking. The details are described in Clause 7.

5 Database

5.1 Geospatial data

5.1.1 General

The geospatial database includes geospatial framework data and unit grid data and can cover the following scope in general: administrative boundaries, geocoded addressing. positioning, place names, land parcel and property, imagery, transport, water, elevation and depth, land cover and land use, as well as statistical information.

5.1.2 Geospatial framework data

5.1.2.1 Classification of framework data

City geospatial framework data should cover the fields of administrative division, transportation, field of water, construction, underground space and components. The framework data should be classified by certain rules and should support multi-level classification and user-defined classification rules.

5.1.2.2 Description and expression of framework data

City geospatial framework data should describe the spatial features and attributes of city geospatial elements and include the temporal characteristics of data collection or updating. Spatial features of framework data should be described in point, line and plane features.

The attribute features of framework data should be composed of basic attributes and extended attributes. Basic data should include a data element category code, unique identification code, data element name, data capture date, and data source. Extended data should be able to be defined based on individual characteristics of data elements.

5.1.2.3 Coding of framework data element

The unique identification code of city geospatial framework data elements should be coded by certain rules.

5.1.3 City unit grid data

5.1.3.1 City unit grid data attributes

The attribute information of city unit grid data should include a unique identification code, name, area, vertex coordinates of a grid, and data capture date.

5.1.3.2 Coding of city unit grid data

The unique identification code of city unit grid data should be coded by following certain rules, including the administrative division code and grid sequence code.

5.1.3.3 Association of city unit grid data

City unit grid data should be associated with relevant data such as geospatial framework data, event data and grid administrator data.

5.2 Event data

5.2.1 Event classification

The event should be classified by certain rules, covering components, urban appearance, environment and environmental order, with multi-level classification and custom configuration supported.

5.2.2 Event data coding

The event should have a unique serial number, which should be coded by following certain rules, such as the administrative division code, the classification, time-stamp and sequence code of the event.

5.2.3 Event data attributes

The event attributes should be composed of basic attributes and extended attributes. The basic attribute includes the serial number, name, classification, administrative division, unit grid, occurrence time and data source of the event. The extended attribute can be defined according to the individual characteristics of the event. Table 1 shows an example of the details of event data attributes.

Table 1 — Event attribute data content, structure, and field code

Order number	Property item name	Field code	Field type	Length of field	Definition and the range of the value domain	Constraints / conditions
1	event code	ObjCode	char	10	event classification code	M
2	event name	ObjName	char	30	the standard name of the event	M
3	administrative division code	DeptCode1	char	10	code of the administrative division of the event	M
4	administrative division name	DeptName1	char	60	the full name of the administrative division of the event	M
5	location of the event	ObjPosition	char	100	description of the location of where the event occurred	M
6	unit grid	BG ID	char	15	unit grid identifier of the event	M
Key M: mandatory						

5.3 Operation data

5.3.1 Overview

Operation data should include the event handling process data, evaluation data of event handling results, processing result evaluation data and public opinion event analysis data.

5.3.2 Event handling process data

Event handling process data should include the event serial number, handler, handling time, status, and opinions, as well as related videos, pictures, files and other information uploaded during the event processing.

5.3.3 Evaluation data of event handling results

The evaluation data of event handling results should include the event serial number, evaluation results, evaluator and evaluation time.

