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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 37114

Sustainable cities and communities — Appraisal framework for datasets and data processing methods that create urban management information

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ISO/TC 268

Secretariat: **AFNOR**

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Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
3.1 Terms related to urban management information	2
3.2 Terms related to artificial intelligence	2
3.3 Terms related to data	3
4 Understanding the context of the appraisal framework	4
4.1 General	4
4.2 Objectives for creating urban management information in sustainable communities	4
4.3 Principles for establishment of appraisal framework	5
4.3.1 Principles related to the Visionary Community	5
4.3.2 Principles related to the Citizen-centric Community	5
4.3.3 Principles related to the Digital Community	5
4.3.4 Principles related to the Open and Collaborative Community	6
4.4 Mapping the scenario of containing datasets and data processing methods	6
4.5 Engaging all interested parties along the data value generation chain	7
5 Overview of the conceptual model of appraisal framework	7
6 Appraisal framework recommendations for indicator class	9
6.1 General	9
6.2 Description of classes	10
6.2.1 Indicator class	10
6.2.2 Indicator classification class	10
6.2.3 Metadata record class	11
6.3 AI applications in indicators	11
7 Appraisal framework recommendations for dataset processing	11
7.1 General	11
7.2 Description of classes	12
7.2.1 Process class	12
7.2.2 Product specification class	12
7.3 Description of enumeration class	12
7.4 AI applications in dataset processing	13
8 Appraisal framework recommendations for datasets	13
8.1 General	13
8.2 Description of classes	14
8.2.1 Dataset class	14
8.2.2 Metadata record class	14
8.2.3 Value appraisal class	15
8.3 Description of enumeration classes	15
8.3.1 Source type class	15
8.3.2 Geographic Metadata class	16
8.3.3 Measure method type class	17
8.3.4 Frequency of data collection class	17
8.3.5 Other classification class	18
8.4 AI applications in datasets	18
9 Feature catalogue	18
9.1 General	18
9.2 Indicator	19
9.3 Classification type	20
9.4 Purpose type	21

9.5	Category type	22
9.6	Topic type	23
9.7	Metadata record	24
9.8	Process	25
9.9	Product specification	26
9.10	Status type	26
9.11	Dataset	27
9.12	Value appraisal	28
9.13	Source type	29
9.14	Geographic Metadata	30
9.15	Measure method type	31
9.16	Frequency of data collection	32
9.17	Other classification	33
Annex A (informative) An Example for Implementation of appraisal framework		34
Annex B (informative) Detailed overall figure		36
Bibliography		37

Foreword

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

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

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

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

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

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

Sustainable cities and communities are reliant on management information to underpin their decision-making on cross-sectoral issues. Urban management information can be created with data obtained from various sources - such as statistics, surveys, measurements and observations, data aggregations where raw data is gathered by machine learning - and expressed in a summary form for statistical analysis.

For efficiency, sustainable cities and communities should understand:

- The rationale and purpose of the urban management information and its intended use;
- The algorithms and processing methods used for creating urban management information;
- The raw data obtained from multiple sources that are waiting to be further processed for creating urban management information.

These three topics and the way they interact with each other are becoming increasingly complex, especially due to the increasing demand for normalised urban management information and the increased volume and variety of data constantly being generated. For this reason, managers of cities and communities need a common framework that can support their decision making without requiring a detailed understanding of data management and techniques and can facilitate effective dialogue with stakeholders.

The challenge with management information for sustainable development is best illustrated by the case of creating indicators. Indicators represent high levels of data aggregation and processing and are widely used to provide a metric for the performance of sustainable cities and communities that can be used to both support policy management and dissemination. However, all indicators are constrained by data availability, data processing methods, and often, lack of metadata standards. For example:

- **The same indicator can have different values using apparently similar data.** Datasets with the same parameters can produce different indicator values due to different measurement or observation methods used to create the data;
- **Comparable indicators can be created from different data.** Equivalent datasets are not available at all locations, but by using suitable processing techniques, comparable indicators can be created;
- **The suitability of a given indicator can vary from time to time.** The impact can be variable purposes, public policies, data-collection methods, data processing methods and scientific advancements.
- **Lack of metadata standards can also hamper collaboration and information sharing among analysts.** A city manager usually gathers data from various sources, including documents, open data portals, smart city systems, statistics, or surveys. All the data is collected in different formats by different organizations or individuals. If there is not a unified metadata standard, this data can result in duplicates, inaccuracies, undetected bad data, or incomplete conclusions.

For these reasons it is important that organization managers share a common understanding of how indicators have been created when selecting indicators and relying on them to make management decisions. This allows for flexibility and agility at the city and community level, with the most appropriate indicators being used at the right time. At the same time there is an increasing number of various data sources and processing methods available, leading to further complexity.

To address the complexity outlined above, it is necessary that organisation managers adopt a consistent and structural framework to manipulate the urban management information they use. This framework should be sufficiently agile and flexible to integrate the strategic, operational, scientific and technology viewpoints that all impact how urban management information is created and used.

As elaborated in [Figure 1](#), the integration of strategic, operational, technical and scientific viewpoints is actually a prerequisite for creating urban management information. At the strategic level, organisations need to set sustainability aims and plan to monitor the sustainability process. At the operational level, organisations need to define roles and responsibilities, develop data supply agreements with stakeholders. At the technical level, cities and communities need to have data processing technology and data storage, and stakeholders need to communicate with each other. At the scientific level, organisations and stakeholders

should have scientific understanding and promote its practical implementation as well environmental observation. After these four aspects are well grounded, the involvement of users should be considered, with the smart city system principles defined in ISO 37106 serving as a guide for the framework. Then, the appraisal framework for datasets and data processing methods that create urban-management information can be established and used.

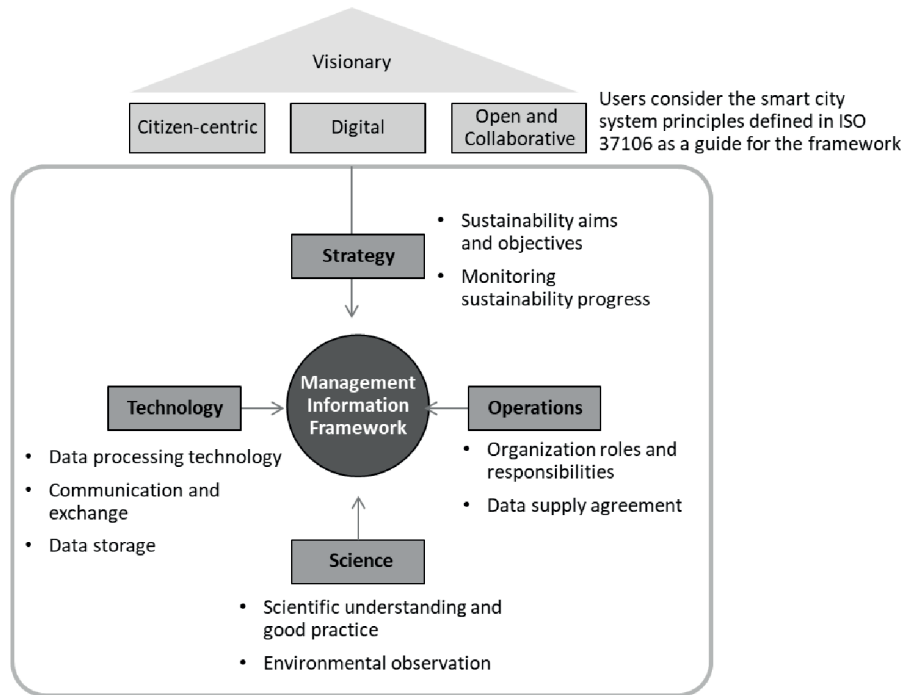


Figure 1 — Management Information Conceptual Framework

This document sets out a methodology, presented as a conceptual framework that allows different ways of implementation with spreadsheets and databases, installed or web-based. This document aids communication among various stakeholders including top management, data enablers, data architects, property owners, facilities management (including asset management), statistical agencies, and so on. The methodology is also technologically neutral, allowing organizations to adopt different technical solutions for generating and using data in accordance with the United Nations Sustainable Development Goals (SDGs), sustainability purposes, issues, objectives, or indicators.

The document also provides a reference for various other interested parties, including building owners, facilities companies, statistical agencies, smart city service providers, software vendors and even financial institutions that offer financing services for the development of the data services industry. This support encourages their participation in the sustainable management of cities and communities. It will support global comparison for smart and sustainable development, and is developed as an extension to the developed standards in the ISO 3710X family such as ISO 37101 and ISO 37104. Accordingly, the data in this document will be organized in response to the 6 purposes of a sustainable city or community elaborated in ISO 37101.

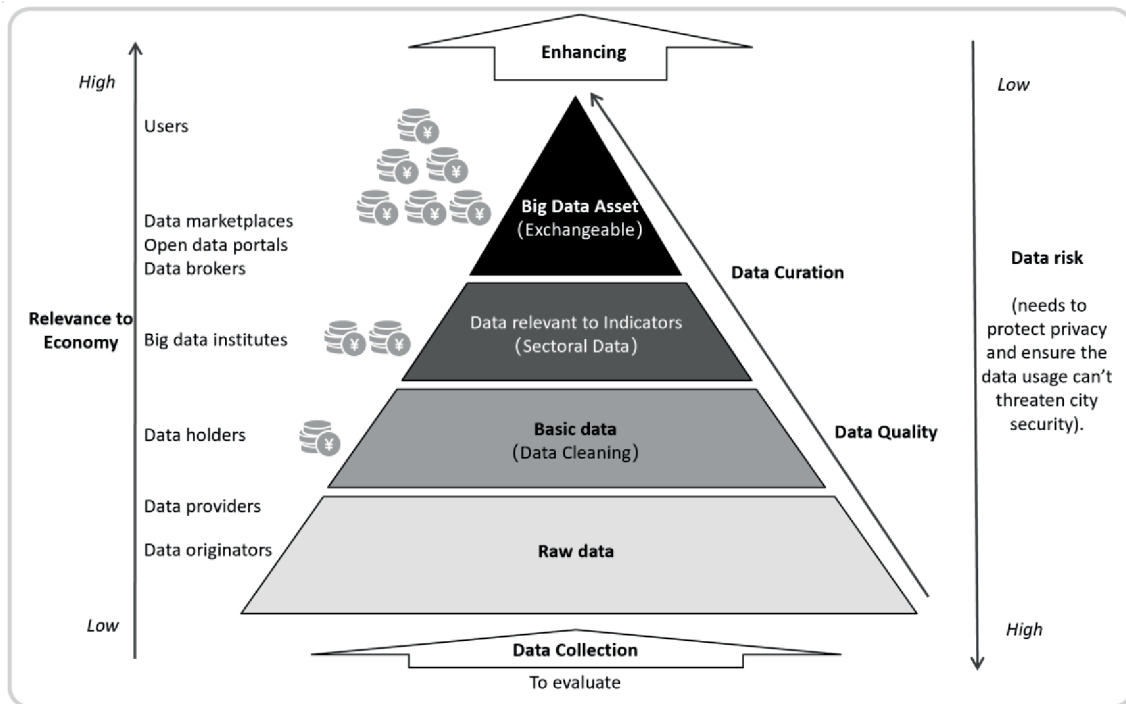


Figure 2 — The Big Data Value Generation Chain in Smart City Systems

This document aims to assist city and community managers in gathering data from various sources. The data processing is important for management organizations and enterprises as it promotes raw data to valuable big data assets. This process involves different interested parties including: the data originators, who generates the raw data through their activities; the data providers who collect these raw data; and the data holders who store and clean the data to make it usable for different scenarios and applications. Additionally, big data institutes perform data mining to transform the data into indicators that can be used for comparison. They also play an important role in protecting the privacy and security of cities and communities throughout the data mining process to develop indicators, rather than directly submitting raw or basic data. Users can obtain these indicators from data marketplaces or open data portals. Sometimes, data brokers can help users by introducing suitable marketplaces for big data institutes or data holders, or by assisting users in purchasing complex datasets. By utilizing these indicators, valuable information can be extracted for business and political decision-making. The indicators can reflect trends, development levels, and relationships within different activities in cities and communities. All the data, datasets, and indicators can be considered as part of urban information management, and they serve as important big data assets in a smart city system. The benefits of big data assets are elaborated through this framework, as shown in [Figure 2](#).

The existence of such a framework therefore supports:

- inter-comparison of performance of different cities and communities with different data-collection regimes;
- appraisal of data collection and data management activities in relation to urban management;
- continuous feedback and transparency of progress towards objectives and goals of city sustainable development;
- communication between organizations and departments responsible for data collection, processing and management activities, based on a series of common vocabularies;
- indicator management and analysis activities compatible with Artificial Intelligence (AI);
- allowing data mining to create commercial value and giving added-value to open data in cities and communities;

- comparison of sustainable performance across different periods.

While this framework primarily focuses on data and dataset management, users need to be aware of the importance of protecting privacy, ensuring data security, and evaluating the potential harm of data usage on cities and communities.

This framework is designed for urban management information, which supports the evaluation of sustainable management systems of cities and communities. ISO 37106 describes smart processes and operating models for sustainable communities, with an emphasis on implementation of a principles-based smart city operating model. The framework described in this document supports this smart operating model with an emphasis on indicator, processing and datasets. This document includes data-specific guidance to implement the overarching strategy elaborated by ISO 37106, in which development of a smart city is informed by four delivery principles: **visionary, citizen-centric, digital and open and collaborative**.

By implementing this document, data can be collected, monitored, and managed in order to facilitate the processing of indicators provided in the ISO 3712X family of International Standards, as well as other standards, in ways that implement the four ISO 37106 delivery principles. Through urban information management, the conceptual framework referred to in this document supports the implementation of the 6 sustainability purposes of ISO 37101 and the 17 UN Sustainable Development Goals (SDGs).

This document has referenced methodologies developed by ISO/TC 211 for the creation of data product specifications (refer to ISO 19131), observation and measurements (refer to ISO 19156) and dataset metadata (refer to ISO 19115).

NOTE This document has been developed in conjunction with Geographic Information/Geomatics standards developed by ISO/TC 211, and Building Information Management (BIM) standards developed within ISO/TC 59/SC 13, including the specific standards of the ISO 19650 series, ISO 23386, and ISO 23387.

This document is not a technical specification for data systems or infrastructures. The related standards developed by ISO (particularly ISO/TC268/SC1, Smart community infrastructures), IEC, or ITU can be regarded as downstream standards that will realize the specification of data of this document.

The document is structured in the following way:

- [Clause 1](#) describes the scope
- [Clause 2](#) lists normative references
- [Clause 3](#) sets out the terms and definitions used in the document
- [Clause 4](#) illustrates the understanding the context of appraisal framework
- [Clause 5](#) provides an overview of the conceptual model of appraisal framework
- [Clause 6](#) describes the appraisal framework recommendations for indicators
- [Clause 7](#) describes the appraisal framework recommendations for dataset processing
- [Clause 8](#) describes the appraisal framework recommendations for datasets
- [Clause 9](#) describes the appraisal framework feature catalogue
- [Annex A](#) provides an example of implementation
- [Annex B](#) provides further detail for [figure 4](#)

Sustainable cities and communities — Appraisal framework for datasets and data processing methods that create urban management information

1 Scope

This document:

- sets out an appraisal framework for datasets and data processing methods that create and use urban management information derived from statistics, objectives, indicators and long-term goals for sustainable development of cities and communities.
- supports numerous combinations of data sources and data processing methods, making it easier to create and maintain urban management information and get ready for value mining of big data within cities and communities;
- provides approaches on how to appraise the necessary data to generate management information in an organization and how to classify them into different categories for regular review and update over time;
- provides functional requirements to support the design and management of information systems, and provides appropriate approaches to monitor daily operation through data analysis;
- will be continuously improved for better performance in the sustainable development field.
- can also be of use in research and education activities.
- can be used to support data and dataset management for the ISO 37120 series, but does not provide guidance on how to use the ISO 37120 series.

This document is compatible with AI systems to facilitate cities and communities to be ready for the future application of AI within digital development areas relevant to sustainable cities and communities, including the use of AI systems to process and analyse data collected from various owners, to identify and solve problems that cities and communities face, to aid decision-making and to achieve sustainability purposes (as listed by ISO 37101) and UN Sustainable Development Goals in the long term. This document is in line with the delivery principles of a smart city provided by ISO 37106, including visionary, citizen-centric, digital, open and collaborative.

2 Normative references

The following documents are referred to in the text in such a way that some or all their content constitutes requirements of this document. For dated references, only the edition for cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37101, *Sustainable development in communities — Management system for sustainable development — Requirements with guidance for use*

ISO/IEC 22989:2022, *Information technology — Artificial intelligence — Artificial intelligence concepts and terminology*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Terms related to urban management information

3.1.1

management information

data, reports, and analysis that are used by managers to make informed decisions within an organization

Note 1 to entry: This information is typically derived from various sources within the organization and is presented in a format that is relevant and useful for managerial decision-making.

3.1.2

urban management information

data, reports, and analysis used by urban planners and managers to make informed decisions related to the management and development of urban areas

Note 1 to entry: This information encompasses a wide range of data, including demographic statistics, infrastructure planning, environmental impact assessments, transportation systems, public services, and other factors that influence the functioning and development of urban environments.

Note 2 to entry: Urban management information plays a important role in guiding policies and strategies for sustainable urban development, infrastructure improvement, and the overall well-being of urban populations.

3.1.3

indicator

quantitative, qualitative or descriptive measure

Note 1 to entry: The indicators in this document can refer to the ISO 37120 series or other sources that are suitable for urban areas.

[SOURCE: ISO 6707-3:2022, 3.10.8, modified – Note 1 to entry has been added.]

3.1.4

dataset

collection of data with a shared format

Note 1 to entry: In this document, the term 'dataset' refers to a collection of data that serves as the foundation for creating indicators. By evaluating the dataset, it is possible to create various indicators.

[SOURCE: ISO/IEC 22989:2022, 3.2.5, modified – Note 1 to entry has been changed]

3.1.5

scenario

description of the sequence of events from the user's perspective to perform a task in a specified context

[SOURCE: ISO/TS 14812:2022, 3.1.12.2, modified – use case related terms has been deleted.]

3.2 Terms related to artificial intelligence

3.2.1

data mining

computational process that extracts patterns by analysing quantitative data from different perspectives and dimensions, categorizing them, and summarizing potential relationships and impacts

[SOURCE: ISO/IEC 22989:2022, 3.1.11.]

3.2.2

inference

reasoning by which conclusions are derived from known premises

Note 1 to entry: In AI, a premise is either a fact, a rule, a model, a feature or raw data.

Note 2 to entry: The term "inference" refers both to the process and its result.

Note 3 to entry: It is important to ensure data quality regardless of whether an AI system is being used or a simple exploratory analysis is performed.

[SOURCE: ISO/IEC 22989:2022, 3.1.17, modified — note 3 to entry has been added.]

3.2.3

prediction

primary output of an AI system when provided with input data or information

Note 1 to entry: Predictions can be followed by additional outputs, such as recommendations, decisions and actions.

Note 2 to entry: Prediction does not necessarily refer to predicting something in the future.

Note 3 to entry: Predictions can refer to various kinds of data analysis or production applied to new data or historical data (including translating text, creating synthetic images or diagnosing a previous power failure).

Note 4 to entry: Data generated from predictions have to be documented for users.

[SOURCE: ISO/IEC 22989:2022, 3.1.27, modified — note 4 to entry has been added.]

3.2.4

artificial intelligence system

AI system

engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives

Note 1 to entry: The engineered system can use various techniques and approaches related to artificial intelligence to develop a model to represent data, knowledge, processes, etc. which can be used to conduct tasks.

Note 2 to entry: AI systems are designed to operate with varying levels of automation.

Note 3 to entry: It is important to be aware of the risks associated with the use of machine learning in AI systems. Machine learning algorithms heavily rely on the quality and accuracy of the data used for training. Additionally, machine learning models sometimes act as black box methods like neural networks and have the potential for tampering with human-designed methods. It is crucial to carefully evaluate the risk of using AI systems

[SOURCE: ISO/IEC 22989:2022, 3.1.4, modified — note 3 to entry has been added.]

3.3 Terms related to data

3.3.1

metadata record

record containing a description of a resource

[SOURCE: ISO 24622-1:2015, 2.10.]

3.3.2

test data

evaluation data

data used to assess the performance of a final model

Note 1 to entry: Test data is disjoint from training data and validation data.

[SOURCE: ISO/IEC 22989:2022, 3.1.14.]

3.3.3

validation data

development data

data used to compare the performance of different candidate models

Note 1 to entry: Validation data is disjoint from test data and generally also from training data. However, in cases where there is insufficient data for a three-way training, validation and test set split, the data is divided into only two sets – a test set and a training or validation set. Cross-validation or bootstrapping are common methods for then generating separate training and validation sets from the training or validation set.