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Framework for integration and operation of smart community infrastructures —

Part 1: Recommendations for considering opportunities and challenges from interactions in smart community infrastructures from relevant aspects through the life cycle

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Cadre pour l'intégration et l'exploitation des infrastructures communautaires intelligentes —

Partie 1: Recommandations pour la prise en compte des opportunités et des défis découlant des interactions dans les infrastructures communautaires intelligentes, des aspects pertinents tout au long du cycle de vie

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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 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).

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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.

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

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A list of all parts in the ISO 37155 series can be found on the ISO website.

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.

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Introduction

Urban density is likely to increase for the foreseeable future, resulting in further urbanization complexity. From this perspective, a “smart community” approach is an important tool for addressing such urban challenges by integrating different forms of infrastructure in a rational and efficient manner.

An important aspect of a smart community is integrating infrastructures as “a system of systems”. In addition, a smart community has various stakeholders, including users, and each smart community infrastructure has extended scope life cycle (see Figure 1).

Until now it has not been possible to ensure consistency across infrastructure types to meet the requirements for smart community infrastructures, as owners have focused on just assembling solutions to each subsystem of infrastructures.

In order to ensure consistency of the specification of smart community infrastructures as a whole, firstly the functions of each subsystem need to be clarified and arranged based on the needs of a smart community. Secondly, the perspectives of various stakeholders and the life cycle of infrastructures need to be considered.

To solve these issues and realize well-functioning smart community infrastructures as a whole, infrastructure development and operation processes are expected to include a common framework, as described in ISO/TR 37152, composed of three elements (see Figure 2):

— element (A): allocation of consistent specification requirements to each component of a system and validation of the allocating procedures;

— element (B): specification requirements associated with interaction and adoption of adequate measures into planning and operation;

— element (C): process to facilitate information sharing and communication among stakeholders.

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On conducting a study, it was found that all stakeholders will benefit from applying this framework (see Clause 5).

This document provides guidelines for realizing element (B), providing specification requirements to manage interactions and to adopt adequate measures into planning and operation. Parts 2 and 3 in the ISO 37155 series will be about elements (A) and (C), respectively. Should it be required, a guidelines document will be developed to support Parts 1 to 3.

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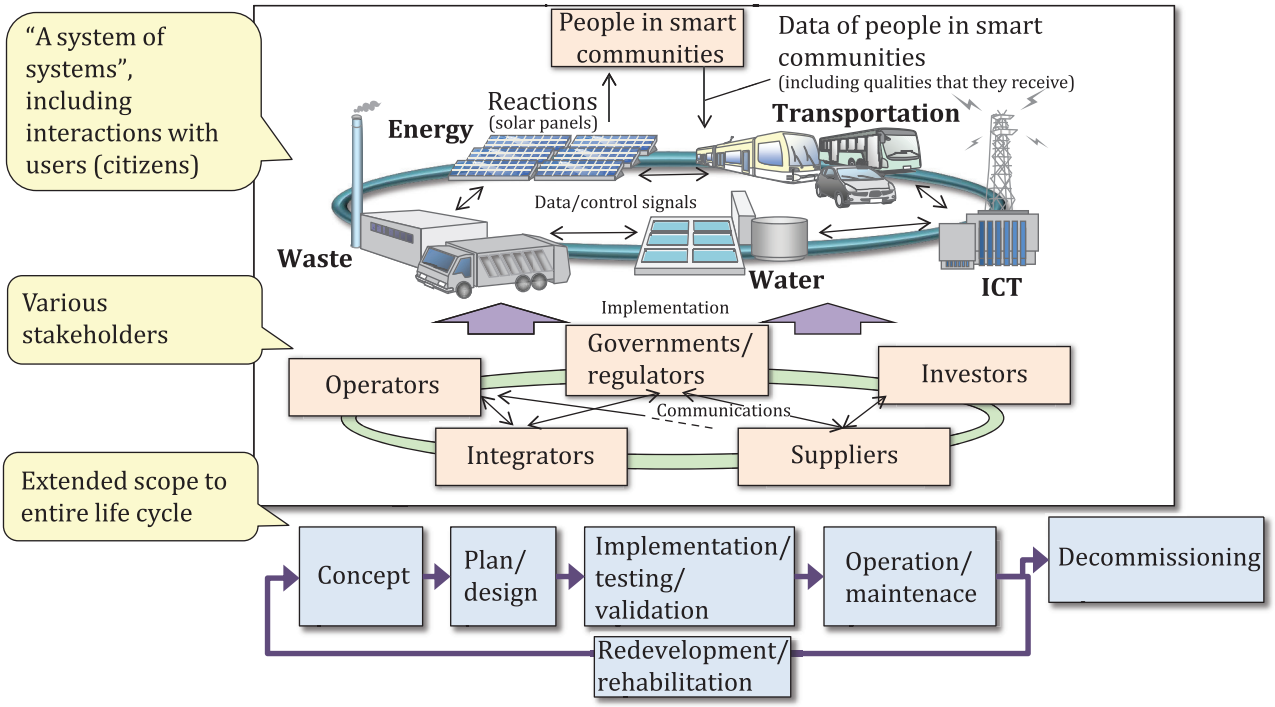

NOTE The infrastructures, stakeholders and life cycle phases pictured in this figure are only examples. Other infrastructures, such as an urban agricultural system, could be included.

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Figure 1 — Characteristics of a smart community infrastructure

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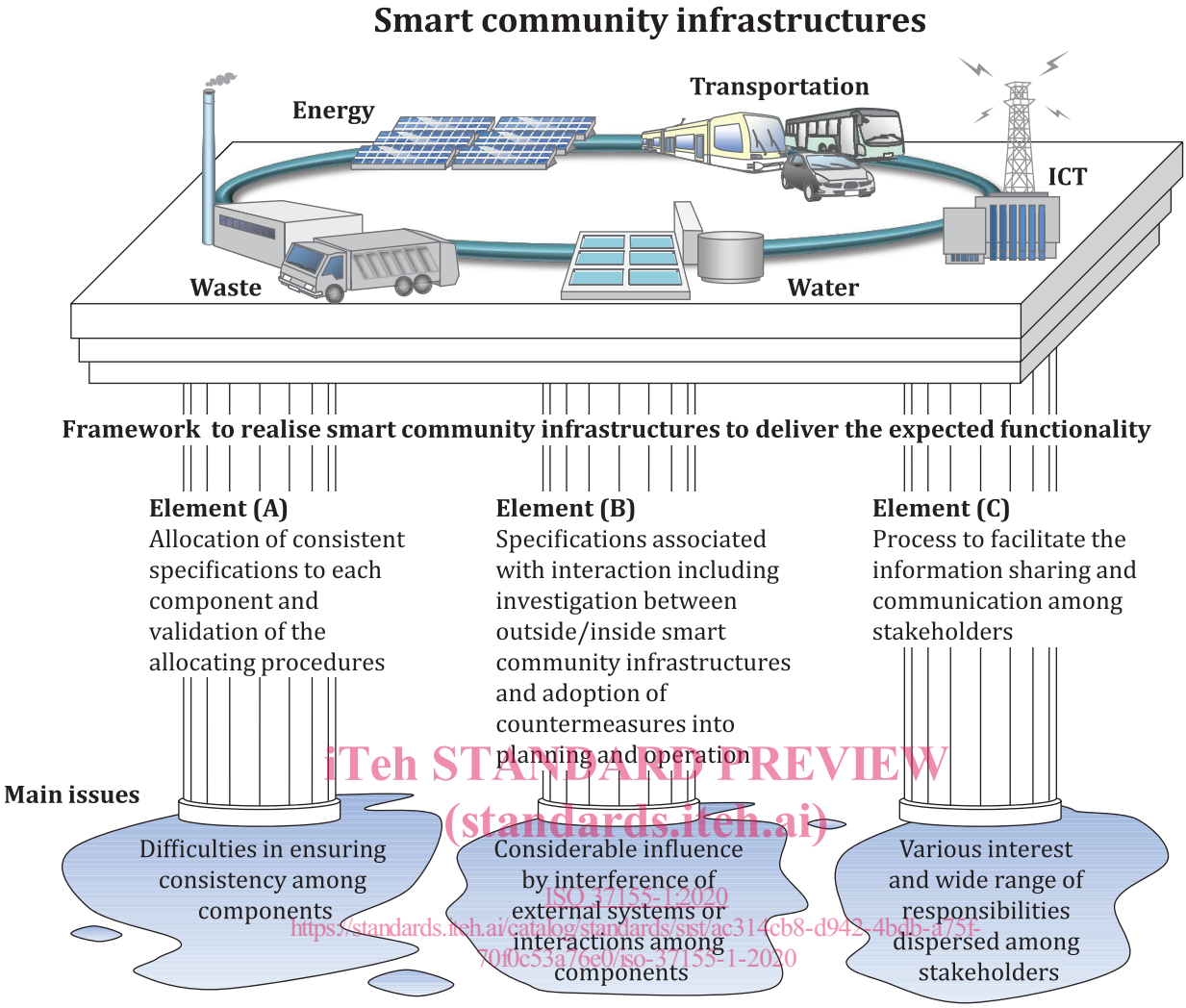

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Figure 2 — Three elements of the framework

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Framework for integration and operation of smart community infrastructures —

Part 1:
Recommendations for considering opportunities and challenges from interactions in smart community infrastructures from relevant aspects through the life cycle

1 Scope

This document describes a framework (a set of processes and methodologies) for smart community infrastructure interactions (interactions between multiple infrastructures, between infrastructures and stakeholders, and between infrastructures and the external environment) to ensure that such interactions are well identified and managed.

There are two potential use cases for this document. The first is for green field sites, where all the smart community infrastructures can be designed and developed at the same time. This is of value to planners and investors of major new infrastructure developments.

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The second builds on the first and will support efficient management of an existing urban area by taking into account the increasing interdependencies of the infrastructures on each other and the way they should be managed as a system of systems. This document will also take into account accelerating technological and environmental changes.

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Since this framework is concerned with ensuring the consistency of different systems consisting of smart community infrastructures, the scope does not overlap with any existing work or deliverables that have been or are being developed by existing TCs addressing issues at individual infrastructure level.

NOTE This document describes a management case (not a management system), i.e. specific processes that an organization needs to follow in order to meet specific objectives of this document.

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 terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
risk
effect of uncertainty on objectives

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

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Note 2 to entry: Objectives can have different aspects (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and process).

Note 3 to entry: Risk is often characterized by reference to potential events and consequences, 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 of occurrence.

Note 5 to entry: Uncertainty is the state, even partial, of deficiency of information related to understanding or knowledge of an event, its consequences or likelihood.

[SOURCE: ISO 31000:2018, 3.1, modified — Notes to entry revised.]

3.2
verification
confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

Note 1 to entry: The objective evidence needed for a verification can be the result of an inspection or of other forms of determination such as performing alternative calculations or reviewing documents.

Note 2 to entry: The activities carried out for verification are sometimes called a qualification process.

Note 3 to entry: The word "verified" is used to designate the corresponding status.

[SOURCE: ISO 9000:2015, 3.8.12]

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3.3
validation
confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

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Note 1 to entry: The objective evidence needed for a validation is the result of a test or other form of determination such as performing alternative calculations or reviewing documents.

Note 2 to entry: The word "validated" is used to designate the corresponding status.

Note 3 to entry: The use conditions for validation can be real or simulated.

[SOURCE: ISO 9000:2015, 3.8.13]

3.4
developer
organization that is responsible for the development and operation of a smart community by organizing *smart community infrastructures* (3.13) in whole or in part

Note 1 to entry: A developer may order *operators* (3.6) to operate and maintain smart community infrastructures.

Note 2 to entry: The roles in 3.4, 3.5, 3.6, 3.10, 3.11 and 3.12 can sometimes be performed by a single organization.

EXAMPLE Private developer, municipality.

3.5
infrastructure owner
organization that owns community infrastructure that is, or could be, smart

Note 1 to entry: An infrastructure owner may order *operators* (3.6) to operate and maintain *smart community infrastructure* (3.13).

Note 2 to entry: The roles in 3.4, 3.5, 3.6, 3.10, 3.11 and 3.12 can sometimes be performed by a single organization.

EXAMPLE Owner of railway tracks, owner of sewage lines, municipality.

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3.6
operator
organization that is responsible for operating and maintaining community infrastructure that is, or could be, smart

Note 1 to entry: An operator may order *service providers* (3.7) to supply a part of or the whole *smart community infrastructure(s)* (3.13).

Note 2 to entry: The roles in 3.4, 3.5, 3.6, 3.10, 3.11 and 3.12 can sometimes be performed by a single organization.

Note 3 to entry: Service provider is included in operator. Operator includes service providers.

EXAMPLE Railway operator, power utilities.

3.7
service provider
organization that is responsible for supplying a part of or the whole *smart community infrastructure(s)* (3.13)

EXAMPLE System integrator, component supplier, ICT vendor.

3.8
consultant
organization that consults, advises on or creates solutions, and assists *developers* (3.4), *infrastructure owners* (3.5), *operators* (3.6), *service providers* (3.7), *community authorities* (3.9) or *investors* (3.11) utilizing its expertise, through development, operation and maintenance of *smart community infrastructure* (3.13)

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EXAMPLE Civil engineering firm, urban design engineering firm.

3.9
community authority
organization that develops and maintains regulations to ensure safety, quality and other important performances of *smart community infrastructure* (3.13)

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EXAMPLE Governmental agency.

3.10
regulator
agency or organization that supervises particular utilities with regards to regulations

Note 1 to entry: The roles in 3.4, 3.5, 3.6, 3.10, 3.11 and 3.12 can sometimes be performed by a single organization.

EXAMPLE Governmental agency.

3.11
investor
organization that invests in development of *smart community infrastructures* (3.13)

Note 1 to entry: The roles in 3.4, 3.5, 3.6, 3.10, 3.11 and 3.12 can sometimes be performed by a single organization.

EXAMPLE Development bank, commercial bank.

3.12
lender
organization that lends to *developers* (3.4), *infrastructure owners* (3.5) and *operators* (3.6) of *smart community infrastructure* (3.13)

Note 1 to entry: The roles in 3.4, 3.5, 3.6, 3.10, 3.11 and 3.12 can sometimes be performed by a single organization.

EXAMPLE Development bank, commercial bank.

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3.13
smart community infrastructure
community infrastructure with enhanced technological performance that is designed, operated and maintained to contribute to sustainable development and resilience of the community

3.14
people in smart communities
users or potential users of *smart community infrastructures* (3.13), who should be considered as important stakeholders

4 Understanding of smart community infrastructure layers

4.1 Smart community infrastructure system layer

This is the layer of whole integrated smart community infrastructures, a system of systems, installed (or planned to be installed) in a specific smart community.

4.2 Smart community infrastructure layer

This is the layer of an individual smart community infrastructure. Some examples for the targets of this layer are energy, water, transportation, waste management and ICT infrastructures.

NOTE Smart community infrastructure can be structured using layered functional blocks.

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4.3 Smart community sub-infrastructure layer

This is the layer of the layered functional blocks of an individual smart community infrastructure. Some examples in a transportation infrastructure for the targets of this layer are railway, light-rail transit (LRT), public bus, rental bicycles, city roads, bridges and tunnels.

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5 Benefits of applying this document

5.1 General

This clause specifies the main benefits that each stakeholder will have through applying this document (see Figure 3).

5.2 General benefits

Application of this document will help stakeholders to:

a) estimate the cost of operation and maintenance in the project planning and budgeting in the initial phase;

b) identify issues and activities through the whole life cycle and take these into account as much as possible in planning and budgeting activities;

c) facilitate the allocation and understanding of responsibility related to the issues and activities among stakeholders;

d) achieve efficient allocation and optimization of energy and material resources, human resources and capital;

e) reduce CO_2 emission and environmental loads, as a result of efficient allocation and optimization of energy and material resources;

f) facilitate coordination and cooperation between stakeholders.

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