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Framework for integration and operation of smart community infrastructures —

Part 2:
Holistic approach and the strategy for development, operation and maintenance of smart community infrastructures

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Cadre pour l'intégration et l'exploitation des infrastructures communautaires intelligentes —
Partie 2: Approche holistique et stratégie de développement, d'exploitation et de maintenance des infrastructures communautaires intelligentes

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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*.

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Introduction

In the foreseeable future, urban density is likely to increase, resulting in further urbanization complexity. From this perspective, a “smart community” approach is an important concept to address the urban challenges by integrating different forms of infrastructures in a rational and efficient manner.

An important aspect of a smart community is integrating infrastructures as “a system of systems”. In addition to that, smart community has various stakeholders including users, and each smart community infrastructure has an extended scope lifecycle (See Figure 1). A major benefit of a system of systems is that the sector specific performance of all infrastructures can be validated with regard to their contribution to the overall goals of a community. As a result of this validation, these goals can be adapted and improvement targets for each infrastructure can be derived. Thus, an intended concept of a smart community being validated and updated through its lifecycle concerning the integration and operation of smart community infrastructures is realized efficiently at all times (See Figure 2).

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, functions of each subsystem need to be clarified and arranged based on the needs for a smart community, and secondly, the perspectives of various stakeholders and lifecycle of infrastructures need to be considered.

To solve the above 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 3).

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— 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;

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

On conducting the study, it was found that each stakeholder will have various benefits through applying this framework. (See Clause 5)

This document provides the guideline to realize element (A), providing guidelines for specification to ensure consistency of smart community infrastructure and to adopt adequate measures into planning and operation. Part 1 is about element (B).

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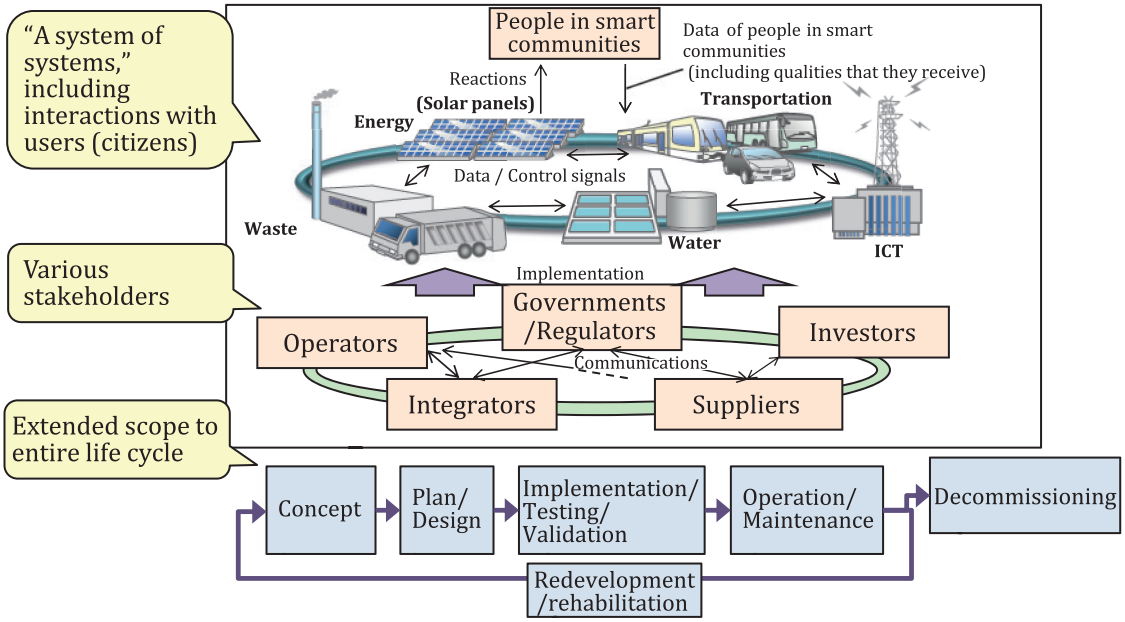

NOTE The infrastructures, stakeholders and lifecycle phases pictured in this figure are only some of the examples. Other infrastructure, such as urban agricultural system, might also be included.

Figure 1 — Characteristics of smart community infrastructure

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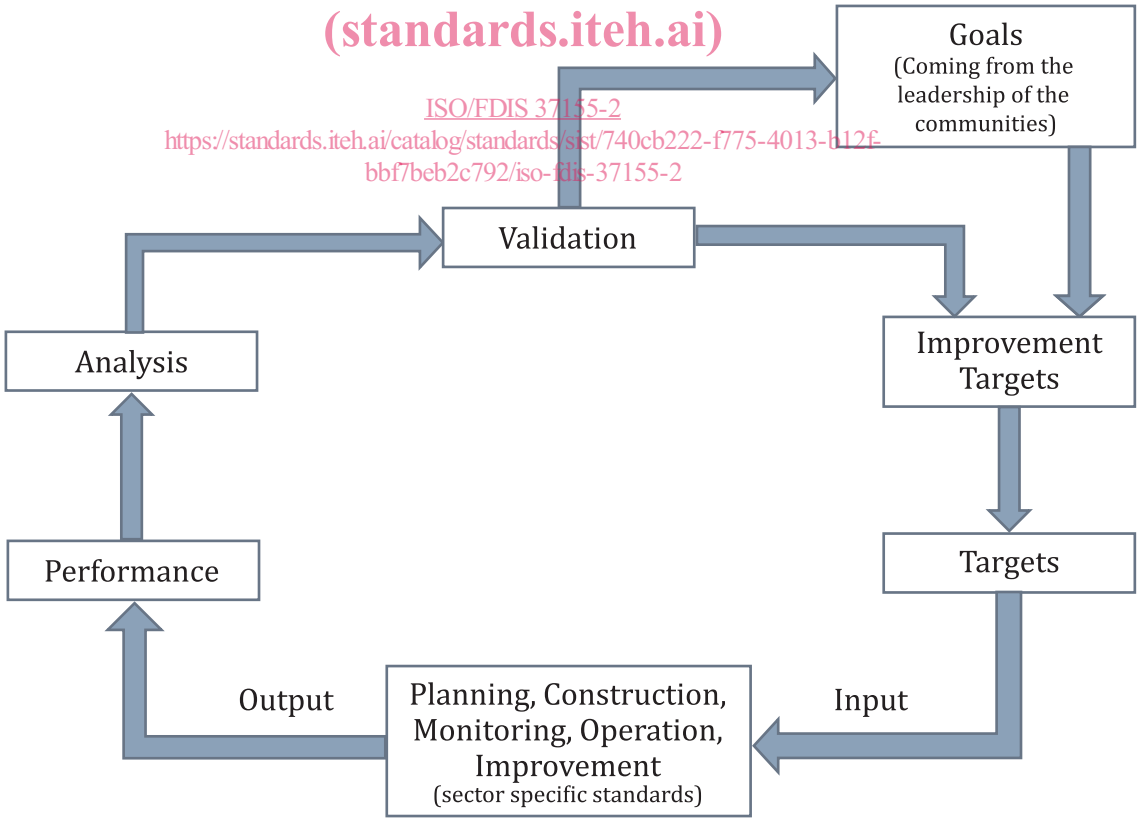

Figure 2 — Workflow of a system of systems concerning integration and operation of smart community infrastructures

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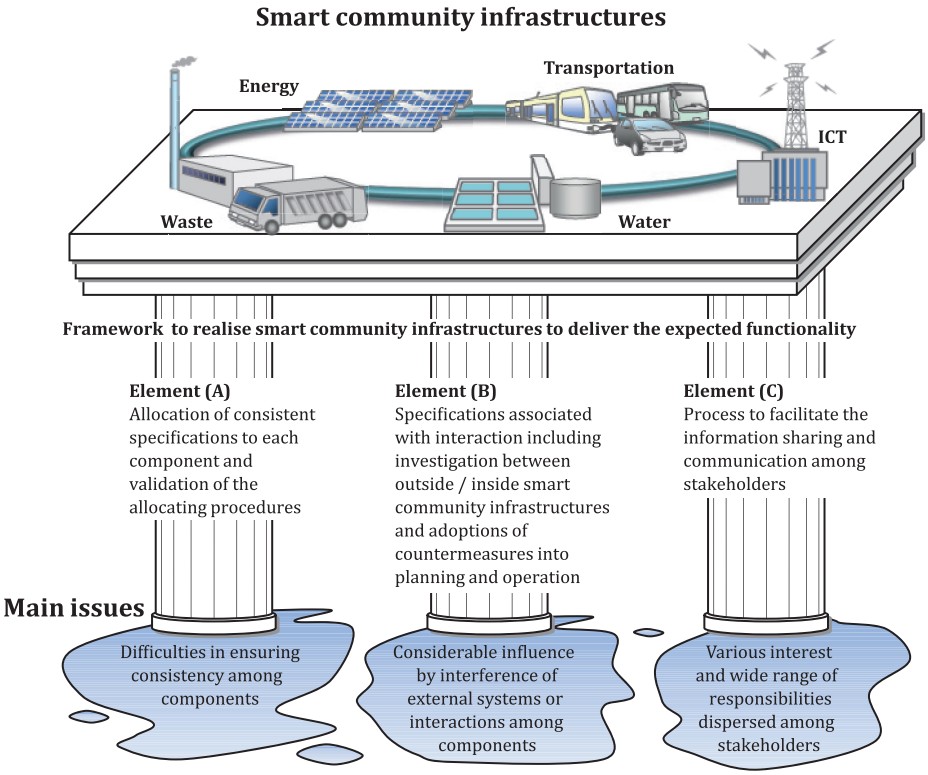

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Figure 3 — Three elements of the framework

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Framework for integration and operation of smart community infrastructures —

Part 2: Holistic approach and the strategy for development, operation and maintenance of smart community infrastructures

1 Scope

This document describes the interactions of smart community infrastructures (interactions between multiple infrastructures, between infrastructures and stakeholders, and between infrastructures and the external environment).

It describes the framework (a set of processes and methodologies) for these interactions to ensure the consistency of smart community infrastructures is well identified and managed.

There are two potential use cases for this document. The first is for the green field site, 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 is for the brown field site and 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 aims to ensure the consistency among different systems consisting of smart community infrastructures, the scope of this document does not overlap with any existing works that are developed or being developed at the 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

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

ISO 37155-1:2020, *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*

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/

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3.1
risk
effect of uncertainty on objectives

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

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 have been 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.

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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

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 of 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.

[SOURCE: ISO 37155-1:2020, 3.4]

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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: 1 to entry: The roles of 3.4, 3.5, 3.6, 3.10 and 3.12 are sometimes be performed by a single organization.

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

[SOURCE: ISO 37155-1:2020, 3.5]

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 of 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.

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[SOURCE: ISO 37155-1:2020, 3.6]

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

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EXAMPLE System integrator, component supplier, ICT vendor.

[SOURCE: ISO 37155-1:2020, 3.7]

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)

EXAMPLE Civil engineering firm, urban design engineering firm.

[SOURCE: ISO 37155-1:2020, 3.8]

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

EXAMPLE Governmental agency, a municipality or its counterpart organization for rural areas.

[SOURCE: ISO 37155-1:2020, 3.9]

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.

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EXAMPLE Governmental agency.

[SOURCE: ISO 37155-1:2020, 3.10]

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

Note 1 to entry: The roles of 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.

[SOURCE: ISO 37155-1:2020, 3.11]

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 of 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.

[SOURCE: ISO 37155-1:2020, 3.12]

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

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[SOURCE: ISO 37155-1:2020, 3.13]

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

[SOURCE: ISO 37155-1:2020, 3.14]

4 Understanding of smart community infrastructure layers

4.1 Smart community infrastructure system layer

This subclause shall be referred to ISO 37155-1:2020, 4.1.

4.2 Smart community infrastructure layer

This subclause shall be referred to ISO 37155-1:2020, 4.2.

4.3 Smart community sub-infrastructure layer

This subclause shall be referred to ISO 37155-1:2020, 4.3.

5 Benefits of applying this document

5.1 General

This clause describes the main benefits that each stakeholder will have through applying this document.

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