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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

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

Partie 2: Approche holistique et stratégie pour le développement, le fonctionnement et la maintenance des infrastructures communautaires intelligentes

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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).

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).

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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*, 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

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):

— 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.

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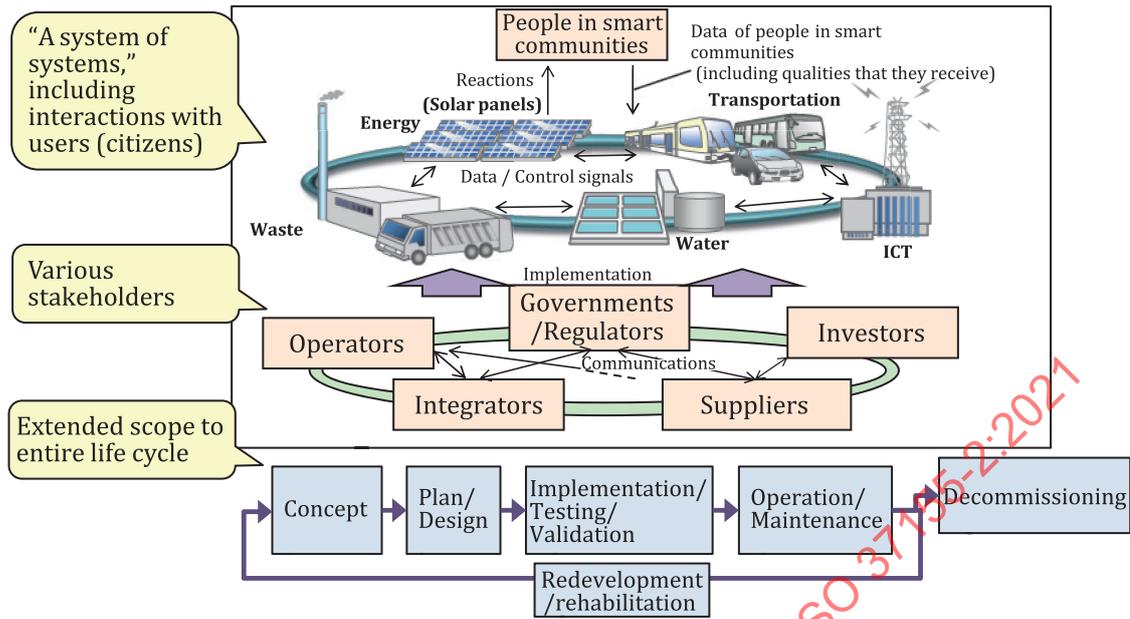
NOTE   The infrastructures, stakeholders and lifecycle phases pictured in this figure are only some of the examples. Other infrastructure, such as urban agricultural system, might also be included.

Figure 1 — Characteristics of smart community infrastructure
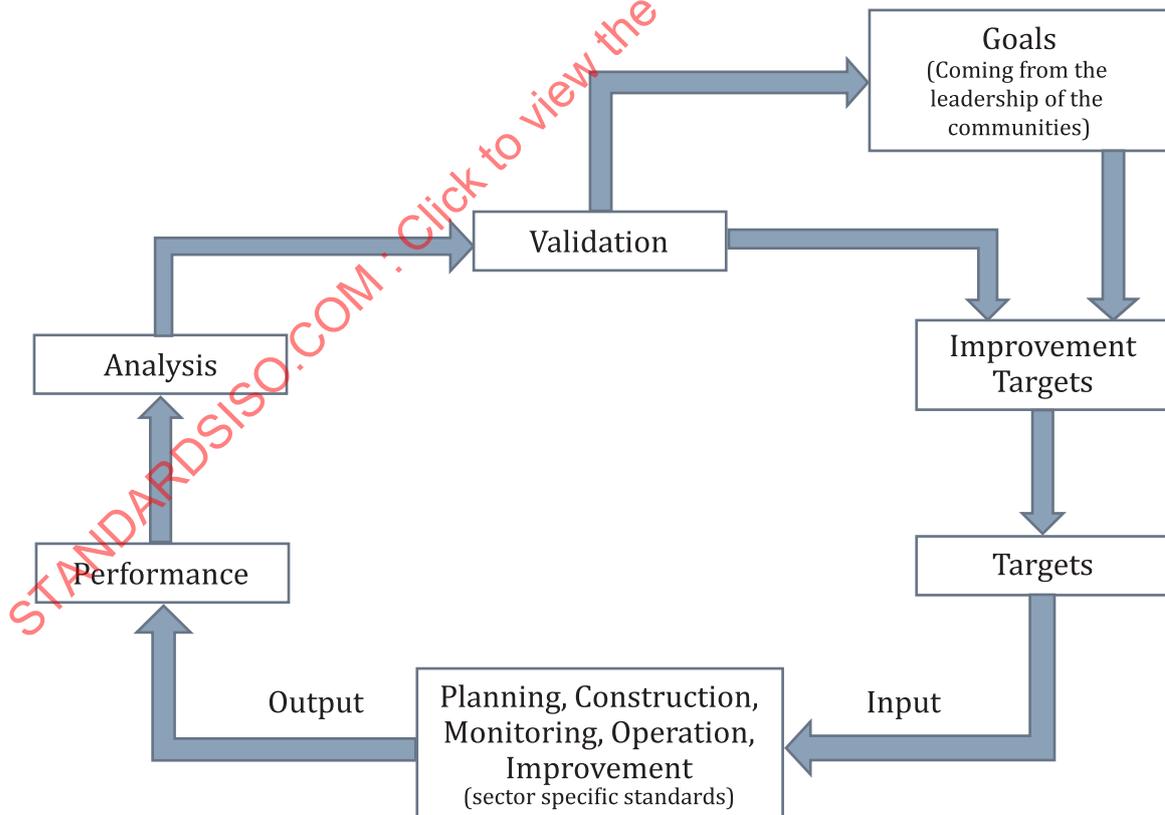
Figure 2 — Workflow of a system of systems concerning integration and operation of smart community infrastructures

Smart community infrastructures

Energy

Transportation

ICT

Waste

Water

Framework to realise smart community infrastructures to deliver the expected functionality

Element (A)
Allocation of consistent specifications to each component and validation of the allocating procedures

Element (B)
Specifications associated with interaction including investigation between outside / inside smart community infrastructures and adoptions of countermeasures into planning and operation

Element (C)
Process to facilitate the information sharing and communication among stakeholders

Main issues

Difficulties in ensuring consistency among components

Considerable influence by interference of external systems or interactions among components

Various interest and wide range of responsibilities dispersed among stakeholders

Figure 3 — Three elements of the framework

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.

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.

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*

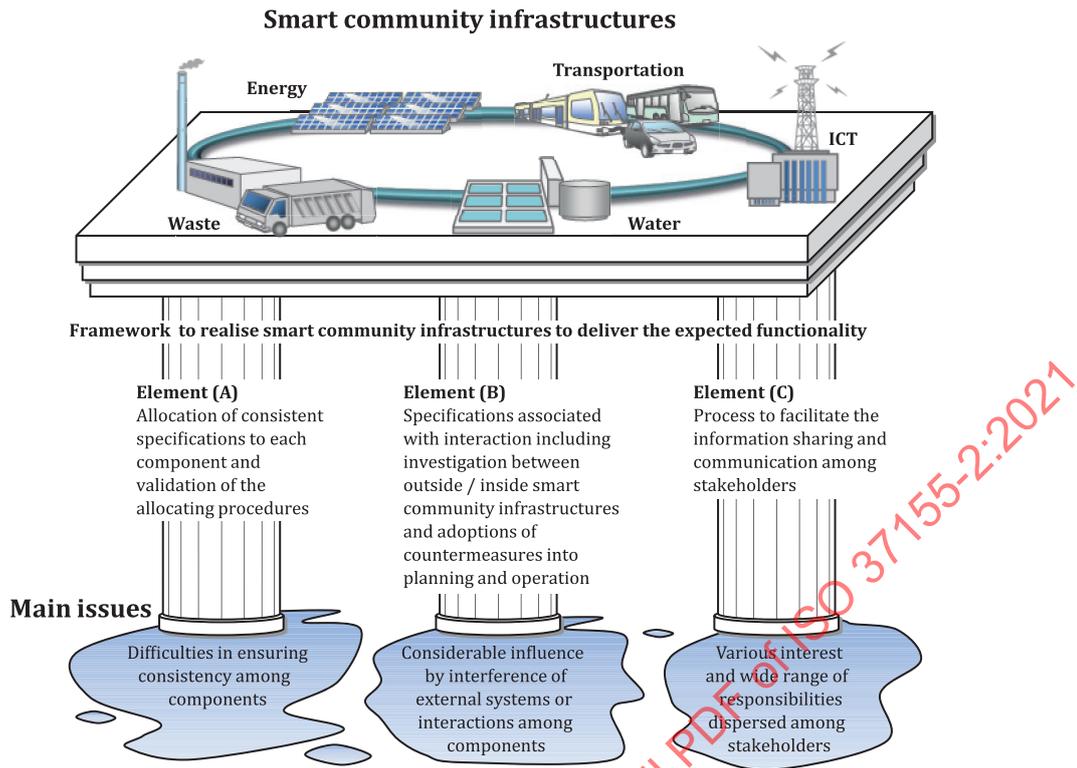## 3 Terms and definitions

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/

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.

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]

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]

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.

[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)*

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.

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

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

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.

5.2 General benefits

Application of this document will help stakeholders to

a) estimate 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 it 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) integrate infrastructures as "a system of systems", for optimizing the operational efficiencies,

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

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

g) facilitate coordination and cooperation between stakeholders.

5.3 Benefits for community authorities

Application of this document will help stakeholders to

a) facilitate identifying opportunities for synergies and identifying risks associated with interactions between multiple smart community infrastructures,

b) facilitate developing regulations, which are related to infrastructure and community activities, by utilizing risk information for ensuring safety and security of the community,

c) achieve cost efficiencies, and

d) evaluate the benefits of the different types of infrastructure in a more holistic manner.

5.4 Benefits for investors or lenders

Application of this document will help stakeholders to

a) decide to invest/loan based on identification of risks at earlier point, and

b) monitor project status to watch for investment/loan control.

5.5 Benefits for developers, operators and infrastructure owners

Application of this document will help stakeholders to

a) achieve high efficiency and quality of the entire smart community infrastructures,

b) facilitate effective procurement management and efficient project management by preventing reworks due to inconsistency or mismatches among components,

c) facilitate accountability for conformity with objectives and needs for infrastructure development,

d) achieve efficient operation and maintenance of smart community infrastructures, and

e) provide effective risk management from perceived hazards and disruptions.

5.6   Benefits for service providers

Application of this document will help stakeholders to:

a)   clarify system requirements for the service providers; and

b)   provide a means for efficient project management as well as accomplishing accountability for how much the system contributes to meeting the objectives and needs for smart community infrastructures development.

5.7   Benefits for people in smart communities

Application of this document will help stakeholders to

a)   facilitate active engagement as an important stakeholder in planning and operating processes through, e.g. data sharing and user data acquisition,

b)   achieve cost effective smart community infrastructure financially acceptable for the users,

c)   enhance the quality of life due to more effective and reliable infrastructure performance as a whole, and

d)   avoid disruptions to citizens' lives when constructing smart community infrastructure, which can be achieved by optimized construction plan in which interactions between the construction and citizens are considered.
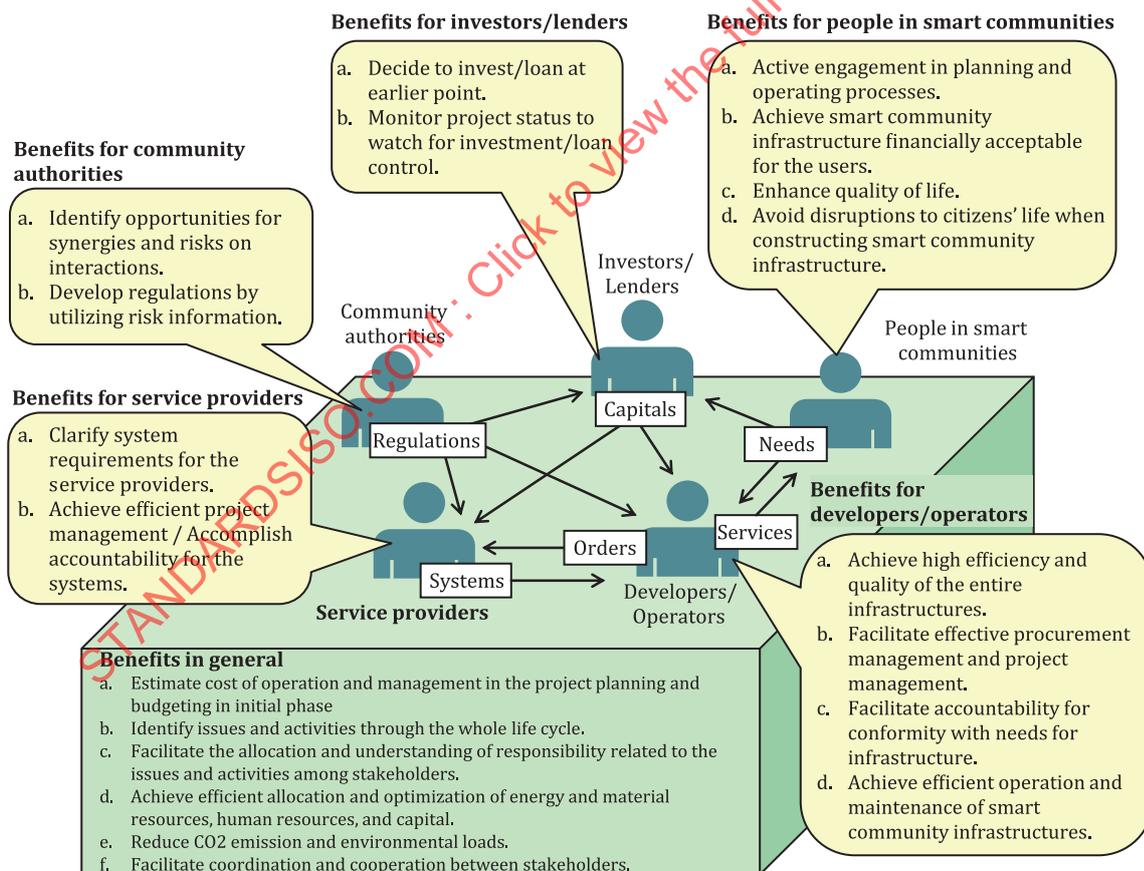

Figure 4 — Benefits of applying this document

6 Life cycle phases of smart community infrastructure

6.1 General

This clause describes the life cycle phases of smart community infrastructure and provides examples of the activities that can be conducted in each phase. The purpose of this clause is to share the examples of the activities, not to define or rule the activities that should be conducted, in each phase.

6.2 Initiation (phase 1)

6.2.1 Smart community concept (phase 1-1)

This is the phase mainly for developing smart community concept.

In this phase,

a) developers clarify the development background,

b) consultants defining the concept clarify the current state of and the needs for the target community (or area) through investigations, and

c) developers decide the scope of the project (e.g. needs to be satisfied) and develop the basic concept of the smart community as a whole.

d) developers or consultants advise different stakeholders on potential concepts or conceptual solution and their impact – both positive and negative.

NOTE   Citizens can be involved in the development at this phase.

Traffic quantity
• pedestrian(people/h)
• vehicle(cars/h)

Geo-environment
• ground strength
• altitude
• flooding risk

Interactions with adjacent/other cities including rural areas
• coming and going of people
• purchase and sale of electricity
• proportion of wastes disposed in the adjacent city

Site owners

XX Factory of XX Company

XX company

Individually owned residential district
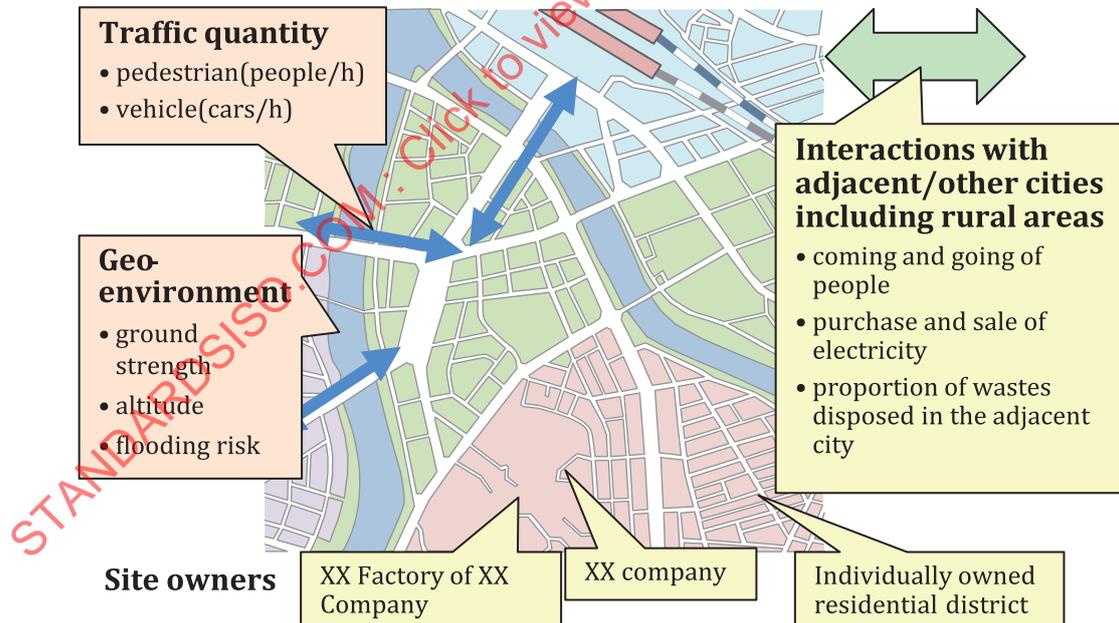
Figure 5 — clarifying the current state of the target area

> **The aims and objectives of developing smart community**
>
> **(1) Zero environmental load**
> - The city's energy demands should be mainly filled by renewable resources.
> - Zero emission electricity.
>
> etc.
>
> **(2) Livable for the elderly and the physically disabled**
> - --
> - --
>
> **(3) Resistant to extreme weather and disasters**
> - --
> - --

Figure 6 — Example of a smart community concept

6.3 Design of target infrastructures (phase 2)

6.3.1 Basic concept (phase 2-1)

This is the phase mainly for developing, in accordance with its smart community concept, a basic concept of smart community infrastructure.

In this phase,

a) developers or consultants defining the basic concepts clarify the goals of the infrastructures as a whole and the approaches to achieve them,

b) the consultants develop a list of possible critical risks from the basic concept, and

c) the developers or consultants are expected to find synergies between different infrastructures needs and goals and suggest concepts, platforms solutions that are common or reusable for more than one infrastructure.

NOTE 1   The infrastructure systems are not necessarily decided at this phase.

NOTE 2   At some stage in the process, the consultants will need to be selected in general. The selection criterion focuses on the consultant's qualifications to undertake the project and not the price for their services. Consultants with a proven history on such projects are critical. Quality based selection (QBS) methods are used.

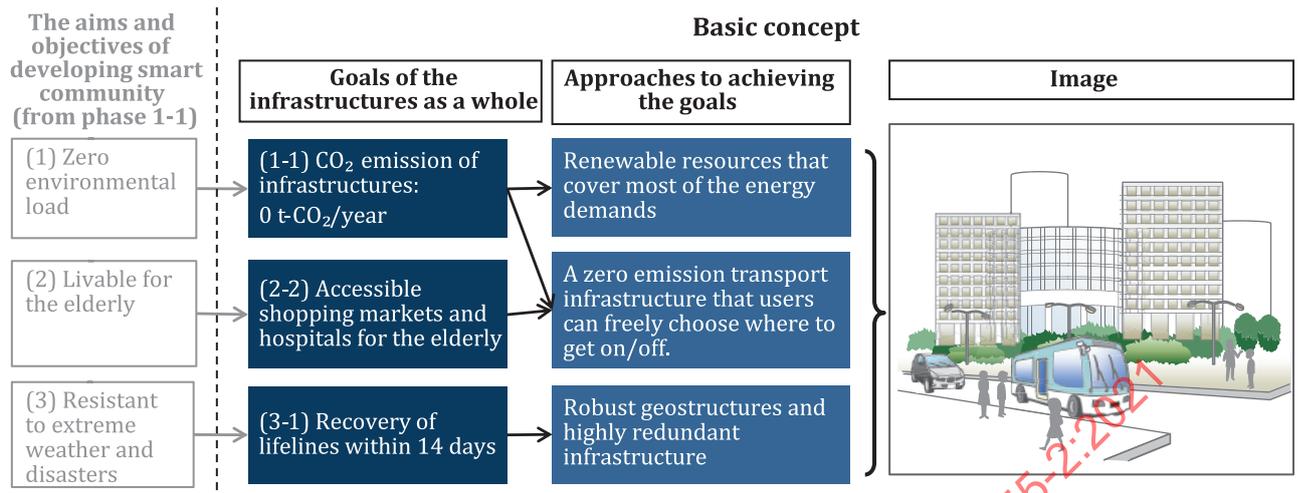NOTE 3   Citizens can be involved in the development at this phase.

Figure 7 — Example of a basic concept

6.3.2 Basic plan (phase 2-2)

This is the phase mainly for developing, in accordance with its basic concept, a basic plan of smart community infrastructure.

In this phase,

a) developers and consultants defining the basic plan are expected to find solutions that are offering horizontal approach that are common or reusable for different infrastructures, enable data exchange or umbrellas monitoring ,and control of different infrastructures

b) the developers or consultants clarify infrastructure combinations to achieve the basic concept,

c) the developers or consultants clarify fundamental specifications of functions for each infrastructure system,

d) the developers select the infrastructure owner or operator of each infrastructure system (e.g. a private company operates by the PPP scheme), and

e) the consultants identify interfaces with external/existing infrastructures and conduct risk assessment related to the interfaces.

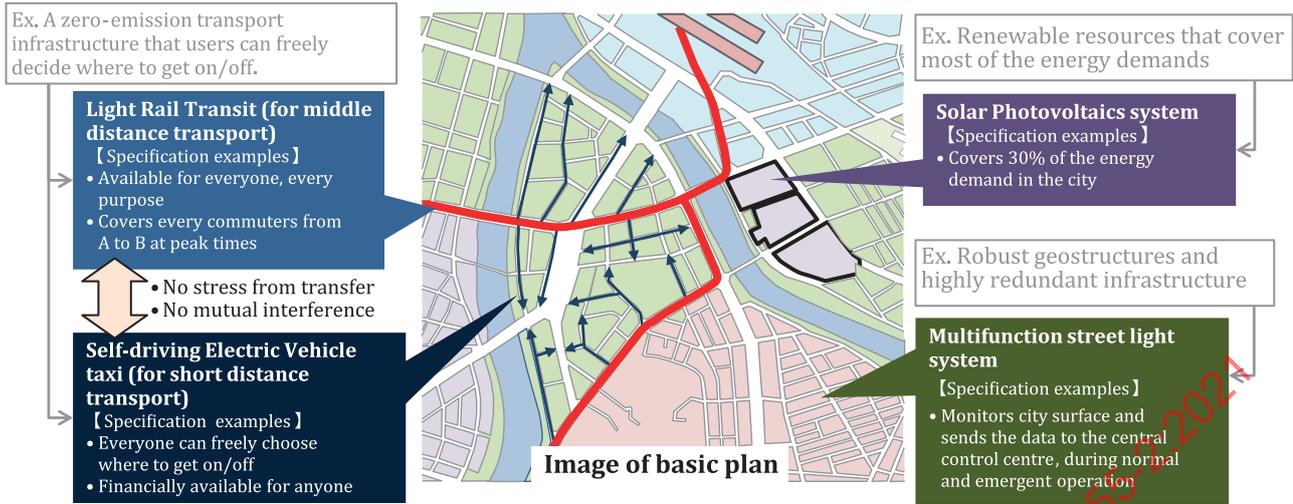NOTE 1   Citizens can be involved in the development at this phase.

Figure 8 — Example of a basic plan

6.3.3 Fundamental design (phase 2-3)

This is the phase mainly for developing, in accordance with its basic plan, a fundamental design of smart community infrastructure.

In this phase, consultants developing fundamental design;

a) clarify external (quantified) specifications of each infrastructure system (the system composition is not necessarily identified),

b) clarify important specifications such as the fee standard and CO_2 emission level of each infrastructure system, or whether it is self-driven or not,

c) present necessary operation and maintenance activities after built or installation phase so that the planning can include the whole project lifecycle cost, or total cost of ownership, and

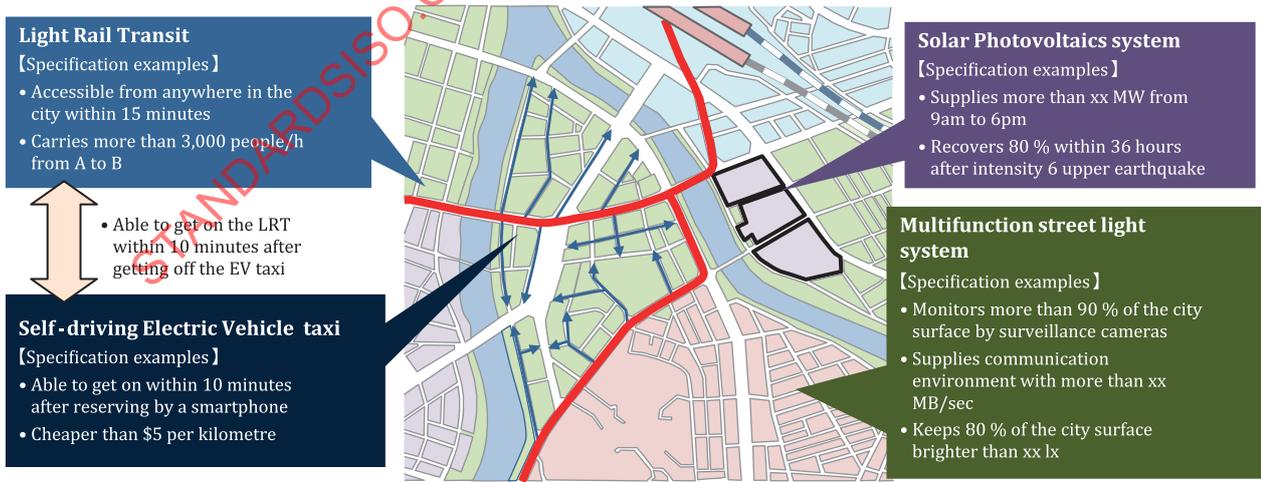d) conduct risk assessment according to the fundamental design.

Figure 9 — Example of a fundamental design

6.3.4 Tendering (phase 2-4)

This phase is mainly about deciding the winning bidder.

In this phase, developers conduct bidding, select the winning bidder, and pass the order.

NOTE 1   In this phase, developers with support from consultants can select most appropriate bidding procedure.

NOTE 2   This phase can be about framing the contract for the delivery of the project. In general, consideration is given to the most appropriate procurement model for the specific project; selection processes for choosing bidders which focus on their qualifications, experience, and ability to successfully achieve the projects goals, rather than just price.

6.3.5   Implementation design (phase 2-5)

This is the phase mainly for developing, in accordance with its fundamental design, implementation design of smart community infrastructure.

In this phase,

a)   winning bidders (operators or service providers) clarify implementation designs, and

b)   consultants developing implementation design conduct risk assessment according to the implementation design.
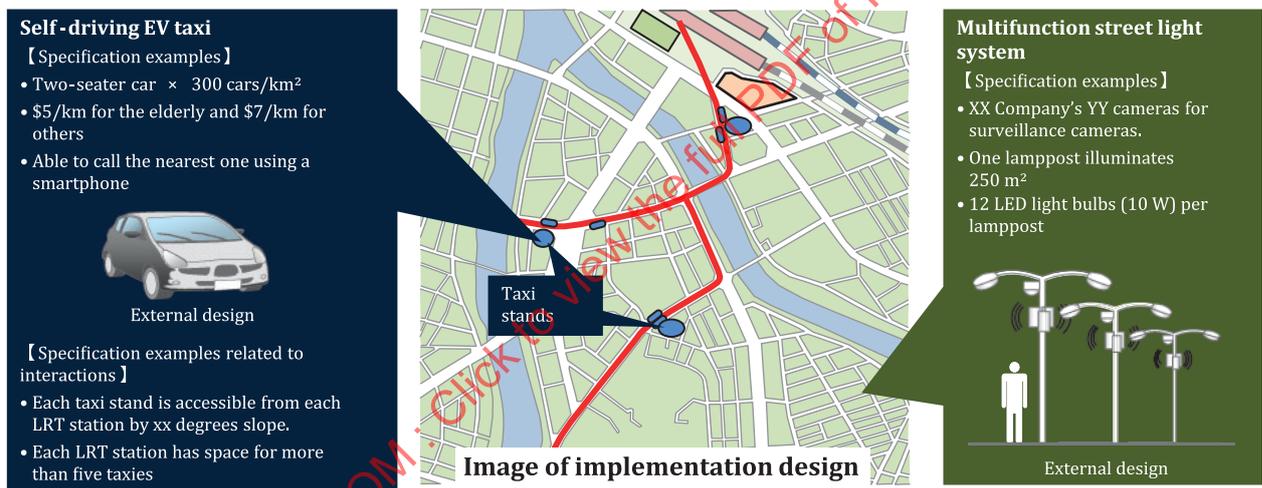

Figure 10 — Example of implementation design

6.4   Construction and assessment (phase 3)

6.4.1   Manufacturing, construction, and installation (phase 3-1)

This is the phase for manufacturing, construction, and installation of smart community infrastructure in accordance with its implementation design.

In this phase, service providers construct smart community infrastructure components and construct and install smart community infrastructure in accordance with the designs.

6.4.2   Individual and combination tests and validation (phase 3-2)

This is the phase for individual and combination tests and validation of smart community infrastructure. The target of individual tests is a specific component, a subsystem or a system of smart community infrastructure. Through individual tests, it is determined whether the component, subsystem or system meets specified requirements. The target of combination tests is the combination of multiple components, subsystems, systems or smart community infrastructures. Through combination tests, it is determined whether these combinations meet specified requirements.

In this phase,

a) service providers and/or third parties conduct individual tests of infrastructure components and systems and combination tests of infrastructure systems, and

b) developers, infrastructure owners, and operators accept or reject, based on the test results, the components, subsystem, systems, or smart community infrastructures.

Individual tests of infrastructure components and systems

【Example test items for EV taxis】

• How properly the self‑driving system functions.

• How properly the smartphone reservation system functions.

* The tests will be conducted in the suppliers' sites or their test courses.
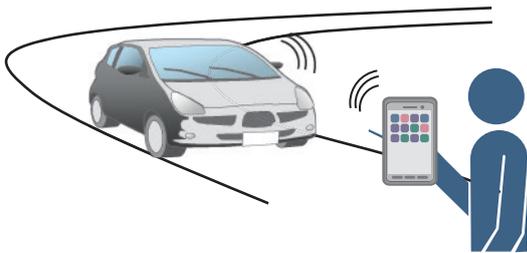
Combination tests of infrastructure systems

【Example test items for EV taxis】

• Whether a user can get in a taxi within 10 minutes of booking.

• Whether the taxies can reach the passengers at a taxi stand within 10 minutes.

* The tests will be conducted at real sites or by simulation.

Figure 11 — Example of individual and combination tests and validation

6.4.3 Overall assessment of smart community infrastructures as a whole (phase 3-3)

This is the phase for overall assessment of smart community infrastructures as a whole. The purpose of the assessment is to determine whether the design and construction of the smart community infrastructures as a whole have met the goals set as part of the basic concept of smart community infrastructure at phase 2-1.

The assessment will be conducted at the direction of the developer, infrastructure owner, or operator.

Overall assessment

**(Conformity assessment for the goals
of the infrastructures as a whole)**

【Example of assessment items】
- Whether the infrastructures are realizing zero emissions.
- Whether an old person can go to hospital by him/herself.

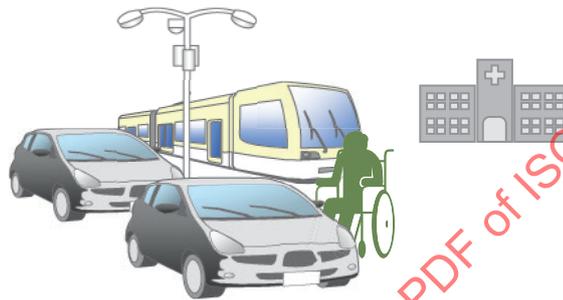* The tests will be conducted in real site or by simulation.

Figure 12 — Example of overall assessment of smart community infrastructure as a whole

6.5 Operation and maintenance (phase 4)

This is the phase mainly for operation and maintenance of smart community infrastructure.

In this phase, the operator of each infrastructure system

a) conducts operation and maintenance according to the plans which includes when possible information gathered from smart community infrastructure in order to introduce preventive and / or predictive maintenance and lower the cost and increase safety,

b) operates assessment and response to system errors of smart infrastructure,

c) addresses the risks that arise (or that are newly identified) in the operation,

d) undertaking mid-course corrections, and

e) introducing improvements in the design and operational systems for the future.

6.6 Redevelopment and rehabilitation (phase 5)

This is the phase mainly for redevelopment and rehabilitation of smart community infrastructure.

In this phase, developers

a) develop plans which include when possible information/data gathered from smart infrastructure in order to introduce controlled lifetime extension and reduce cost and increase safety for redevelopment or rehabilitation of smart community infrastructure, and

b) conduct redevelopment or rehabilitation of smart community infrastructure in accordance with the plans.

NOTE Adaptation, modification and conversion of smart city infrastructures are included in redevelopment.

6.7 Decommissioning (phase 6)

This is the phase mainly for decommissioning of smart community infrastructure.

In this phase, developers

a) use and analyse data collected from smart infrastructure in order to perform decommissioning in the most cost-efficient and safe way,

b) develop plans for decommissioning of smart community infrastructure, and

c) conduct decommissioning of smart community infrastructure in accordance with the plans.

NOTE 1   Citizen's involvement is effective to develop decommissioning plan.

NOTE 2   The government can contribute to form the infrastructure for the data utilization.

7 General process to ensure consistency

7.1 General

This clause describes the general process to ensure consistency in order to achieve effective and efficient development, operation and maintenance of smart community infrastructures.

7.2 Process overview

The process to ensure consistency should be based on a "V process" as presented in Figure 13. The "V process" ensures that a concept of a smart community is being realized by verifying accomplishment of intended functions of each infrastructure at all levels of development, operation and maintenance of the smart community.

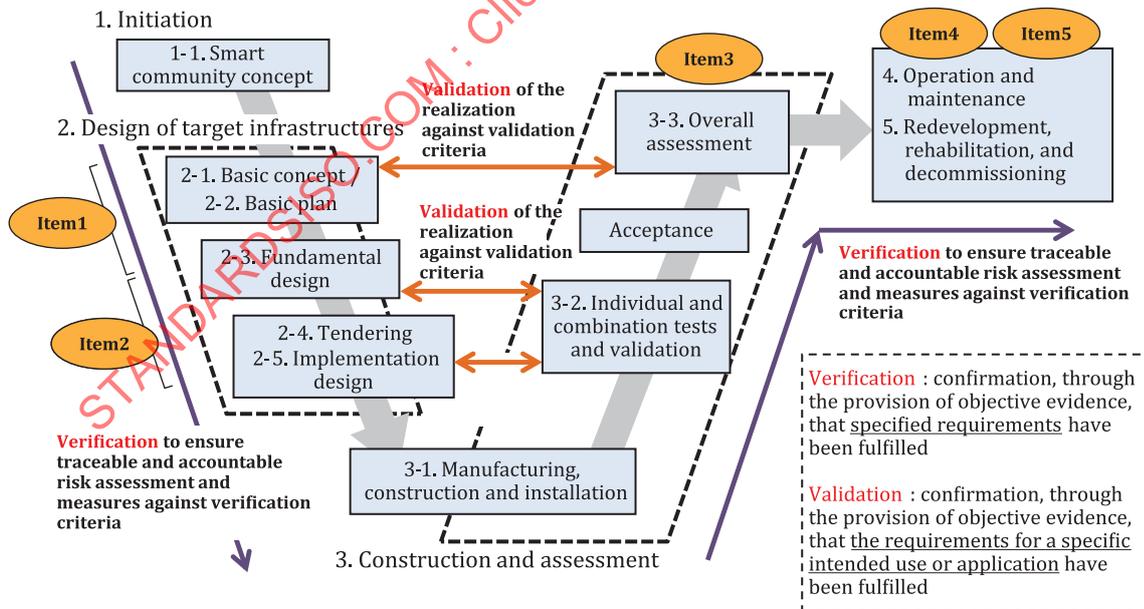NOTE   In actual implementation, there might be some overlapping of V processes.

Figure 13 — "V process" for the standard

7.3   Action items in V process (item 2 in Figure)

7.3.1   Item 1: Setting the targets for infrastructures

In order to achieve the goal of the smart community, relevant infrastructures should be identified and the targets for those infrastructures should be set.

EXAMPLE   Targets can be:

— to point out the special area to be served;

— to improve energy efficiency.

7.3.2   Item 2: Analyse the solutions for different infrastructures to achieve the targets

In order to achieve the targets, the possible solutions should be analysed based on risk assessment.

7.3.3   Item 3: Validation and Verification

The solutions should be validated and verified after all relevant phases and before solutions are put into operation in order to meet the targets.

7.3.4   Item 4: Monitoring the performance of infrastructures

The assigned performance of infrastructures should be monitored and data should be collected in order to meet the goals.

7.3.5   Item 5: Improve the targets

In order to achieve the goals, the infrastructure targets should be improved if necessary.

8   Guidelines for ensuring consistency

8.1   General

This clause details recommendations to be undertaken throughout each life cycle phase to realize validation and verification in ensuring consistency of smart community infrastructure. The scope and application of the recommendations should be assessed and adapted to meet the particular recommendations of the target infrastructure.

Operators, infrastructure owners and service providers should be involved in all activities at each phase.

8.2   Smart community concept (phase 1-1)

8.2.1   Recommendations for verification and validation

8.2.1.1   When clarifying the backgrounds of the development,

— the development background of smart community and target infrastructure should be clarified.

8.2.1.2   When clarifying the current state and needs,

a) the environment of smart community, including physical, potential system interface, social, political, legislative, economic issues, should be clarified, and

b) the needs for development of smart community and target infrastructure should be clarified.

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8.2.1.3   When developing the basic concepts of smart community as a whole,

— the goals of smart community and target infrastructure should be clarified.

8.2.2   Responsibility

Developers can be responsible for the undertaking of the recommendations shown in 8.2.1.

8.3   Basic concept (phase 2-1)

8.3.1   Recommendations for verification

8.3.1.1   When developing the basic concept of smart community infrastructures,

a)   the infrastructures to achieve the goal of the smart community should be clarified, and

b)   based on the goal of smart community, the goal of each infrastructures should be allocated.

8.3.1.2   When addressing the risks that can be identified from the basic concept,

a)   the environment of target infrastructure, including physical, potential system interface, social, political, legislative, economic issues, should be clarified, and

b)   risks should be sufficiently identified from the feasibility studies.

8.3.2   Recommendations for validation

When developing the basic concept of smart community infrastructures, addressing the risks that can be identified from the basic concept,

a)   achievement criteria for the goals of infrastructures as a whole and their evaluation methods should be clarified, and

b)   management policies and processes in case of shortfall of the goals should be clarified.

8.3.3   Responsibility

Developers can be responsible for undertaking the recommendations shown in 8.3.1 and 8.3.2.

8.4   Basic plan (phase 2-2)

8.4.1   Recommendations for verification

8.4.1.1   When developing the basic plan,

— functions and performances necessary to achieve the goal of target infrastructure should be allocated to sub-infrastructures.

8.4.1.2   When addressing the risks that can be identified from the basic plan,

a)   risks that will be caused by the allocated functions and performances should be identified and evaluated, and

b)   the basic plan of the target infrastructure should be based on the result of the risk assessment.

8.4.2 Recommendations for validation

When developing the basic plan, addressing the risks that can be identified from the basic plan,

a) achievement criteria of functional specifications for each infrastructure system and the methodologies to evaluate the achievement should be clarified, and

b) management policies and processes in case of an incomplete specification should be clarified.

8.4.3 Responsibility

Developers can be responsible for undertaking the recommendations shown in 8.4.1 and 8.4.2.

8.5 Fundamental design (phase 2-3)

8.5.1 Recommendations for verification

8.5.1.1 When developing the fundamental design,

a) external specifications for sub-infrastructures should be set in accordance with the risk assessment conducted in the basic plan, and

b) citizen's involvement could be taken into consideration.

8.5.1.2 When addressing the risks that can be identified from the fundamental design,

a) risks that will be caused by the external specifications should be identified and evaluated, and

b) the fundamental design of the target infrastructure and sub-infrastructure should be based on the result of the risk assessment.

8.5.2 Recommendations for validation

When developing the fundamental design and addressing the risks that can be identified from the fundamental design,

a) achievement criteria of external specifications for each infrastructure system and the methodologies to evaluate the achievement should be clarified, and

b) management policies and processes in case of incomplete specifications should be clarified.

8.5.3 Responsibility

Developers can be responsible for undertaking the recommendations shown in 8.5.1 and 8.5.2.

8.6 Tendering (phase 2-4)

8.6.1 Recommendations for verification

8.6.1.1 When conducting tender,

a) tender requirements should be set in accordance with the fundamental design, and

b) requirements to select operators/service providers properly according to the risk level of the target infrastructure should be included in tender requirements.