戦略的イノベーション創造プログラム
Cross-ministerial Strategic Innovation Promotion Program

Smart City Reference Architecture White Paper

Cross-ministerial Strategic Innovation Promotion Program (SIP) Second Phase
Big-data and AI-enabled Cyberspace Technologies /
Smart City Architecture Development /
Smart City Architecture Design and Promotion of Related Verification Research

March 31, 2020
(First edition)

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Executive Summary

This “Smart City Reference Architecture White Paper” is a portion of deliverables of Cross-ministerial Strategic Innovation Promotion Program (SIP) Second Phase Big-data and AI-enabled Cyberspace Technologies / Smart City Architecture Development / Smart City Architecture Design and Promotion of Related Verification Research, which was conducted by Japanese Government in FY2019.

For Smart City Projects conducted in FY 2020 by multiple ministries and departments of Japanese Government, related ministries/departments have declared to work together in an aligned way under the shared “common basic principles”:

1. Define Clear Vision

   Target vision and achievement goals must be clearly defined based on real needs of each region and its initiatives must be designed to solve region-specific issues and thus becoming sustainable.

2. Visualize overall perspectives using architecture model

   In every regional activities of Smart City projects, its action items shall be examined according to the component classification of smart city reference architecture, thereby visualizing the integrity among the components constituting the Smart City.

3. Ensure interoperability

   Federation of data must be enabled across subject domains and service domains in a city and also interoperability of data between cities must be ensured. Implementation plans shall be evaluated in reference to the functions leading to enhanced interoperability (such as open APIs). For projects focused in specific vertical domains (such as mobility, logistics), implementation of solutions should be conducted in view of potentially making cross-domain data federation in the future.

4. Ensure scalability

   In view of evolution of technologies, assume to deploy the mechanism which allows easy addition or upgrading of components. In particular, encourage collaboration with a broad range of data providers. Also, take considerations not to block entry of new services or startups businesses.

5. Formulate regional organization/initiative

   Invite citizen’s participation and collaboration among public-private-academic sectors to come up with a necessary organization to drive Smart City in the region, thereby making the overall initiative sustainable.

This white paper has been officially defined to serve as the reference in working along with the aforementioned common basic principles.

In view of such positioning and responsibility in Japan, the smart city reference architecture was modeled with placing its prioritized target to enable,

- Federation of services across cities and easy replication of outcomes and best practices to other cities nationwide,
- Cost-efficient service development leveraging Smart City's common operation environment (City OS), thereby encouraging creation of new business models,

and also designed to serve as shared guidance to public, private and academic stakeholders.

This whitepaper, as a consequence, assumes its targeted readers to be, but not limited to, (1) government and organizations building strategies for Japan's Smart Cities, and (2) entities working to provide various services in Smart City, and provides a comprehensive and detailed description on the necessary components and their implementation guidelines in order to understand the overall structure and requirements. It should be noted that a sister deliverable to this white paper, "Guide book: How to use Smart City Reference Architecture", should be more useful to the regional governments or entities driving Smart City initiatives, which provides actual procedures of how to solve region-specific issues based on the reference architecture.

In the following, we provide a high-level summary of the key points addressed in the report. For more details, please consult the respective sections of the report.

Smart City Reference Architecture

Four basic concepts are given, which are indispensable to promote Smart City initiatives in Japan and thus form the basis for constructing this Smart City Reference Architecture:

(1) User-centricity principle

(2) Role of City Management: for sustainable Smart City management in regional community

(3) Role of City OS: for federation of data and services efficiently and without restrictions

(4) Importance of interoperability: for efficiently advancing Japan-wide Smart City implementation

The overall logical picture of the smart city reference architecture is accordingly derived, which is then defined to consist of following six foundational components/layers (“viewpoints”).

Smart City Strategy

This viewpoint defines all the rest of the components in the reference architecture and the logical framework of defining Smart City Strategy is described. The task of formulation should proceed from distillation of central issue of the region, then to defining high-level goal and further breaking it down into mid- and lower-level goals following the logical consequence. The formulation process of Smart City Strategy completes after finally defining a set of quantitively assessable indices: Key Goal Indicators (KGI) and Key Performance Indicators (KPI). This strategy formulation framework is then applied to analyze the example of existing Smart City activities in two cities (Aizu-Wakamatsu and Takamatsu) in order to provide a better understanding on how to proceed to be referenced by each Smart City initiative in Japan.

Smart City Rules

The extent of rules to be taken into consideration for advancing Smart City in respective regions is discussed. The legislation and regulations relevant to Smart City include those on privacy prevention (laws and ordinances) as well as data utilization (such as Public-private Sector Data Utilization Advancement Act). Also, region-specific rules are important in governing and managing region-specific services and regional collaboration councils. The rule-making practice of Kakogawa City, upon their introduction of Safety-care cameras, is exemplified how the city coped with privacy matters in order to enhance well-being of citizens by developing consistency between the newly introduced rule and service. From the Smart City perspective, Open Data Policy also plays a very important role.

City Management

The core enabler of achieving sustainable governance and management of Smart City activities is defined to be regional Smart City collaboration organization which is participated by necessary stakeholders. A framework of how to formulate such

organizations is presented, defining six category of stakeholders, their respective rolled to be played and how to set up the overall leadership that best fits with the regions background. Some reference example for such regional collaboration mechanism are also given for Aizu-Wakamatsu City, Takamatsu City and Otemachi-Marunouchi-Yurakucho District (in central Tokyo). Together with such governance mechanism, business aspect is also crucial to the success of Smart City, which is factorized into business model management and user experience design. Business model design mechanism typically is categorized into three types; regional consortium-led, local government-led, private sector-led, for which examples of Aizu-Wakamatsu City, Toyama City and Fujisawa SST are described how they are managing regional business models, respectively. Meanwhile, user experience design is also important from the viewpoint of User-centricity principle and its working framework is presented together with the actual service design effort seen in Aizu-Wakamatsu City, Ohtemachi-Marunouchi-Yurakucho district and Takamatsu City.

Smart City Service

Services deployed in each region stems from regional issues and Smart City strategy. So this chapter focuses on elaboration of successful regional use cases: AI chatbot service (Aizu-Wakamatsu City), Wide-area disaster prevention service (Takamatsu City), Health & well-being incentive point service (Sapporo City), Citizen safety-care service (Kakogawa City). For reference, more extensive list of regional services are also given for important domains.

City OS

City OS is defined as a set of system functionalities with enable access to a variety of data provided from/to Smart City Assets as well as external systems and then achieves appropriate brokering of such data with Smart City Services. Features and requirements for City OS are determined after examining lessons learned as issues from earlier Smart City efforts in Japan.

(1) Interoperability (“connect”):

To enable replication of services and outcomes to other regions/cities via implementation of interoperability mechanism such as standard-based open APIs and common data models.

(2) Data exchange (“flow”):

To enable cross-domain services to overcome region-specific issues through data exchange beyond silo walls of domains and organizations, for which optimum management mechanism for heterogeneous data and options for data brokering scheme are discussed.

(3) Scalability (“Future-proof”):

To enable future expansion of functionality and continued upgrading of system in view of possible change in regional issues as well as technology evolution by leveraging flexibility of building-block approach as well as transparency and verndor-neutraltiy of open source approach.

Such features/requirements for City OS are then respectively mapped onto the actual components of Smart City Reference Architecture; service federation, authentication, service management, data management, asset management, external data federation, security and management. The technical requirements for these eight components are elaborated in view of consistency with overall requirements for the City OS, together with the necessary federation also with services and City OS of other cities as well as external services. Throughout the discussion of City OS, the global best practices for ensuring interoperability and scalability in Smart City initiatives such as synchronicity (its minimum interoperability mechanisms), IES-City framework (by NIST) and European Interoperability Framework, as well as several leading implementations of interoperability in data exchange/management including FIWARE, X-Road and India Stack, together with various global standards for APIs and interfaces, are referenced to address global harmonization of interoperability.

The Smart City Reference Architecture thus designed should be further curated and advanced toward future as a continued effort and also with the global perspective, by joining forces of stakeholders from public, business and academic sectors in Japan.

Contents

1. Introduction

In recent times, digital technology has become so essential for innovations that it is virtually impossible to talk of any new solutions without referring to digital technology. As a result, there are various initiatives around the world related to Smart City which utilizes digital technology to resolve issues.

Smart City related activities are gaining momentum all across Japan, and it is important to accelerate such trend going forward as promoting Smart City across the country contributes to further development and improved productivity of our country. On the other hand, due to the fact that Smart City encompasses a broad range of efforts, several issues have recently become apparent.

First of all, as Smart City requires a very wide range of activities, there exist regions and municipalities which are confused as to how to get started, what to focus on, and generally how to proceed even though they might have willingness to address Smart City.

Secondly, if regions and municipalities move ahead building the system as the infrastructure of Smart City each adopting different specifications, it would result in lack of compatibility when trying to exchange data and services between the regions, hence causing significant cost for data portability and horizontal development of services.

This White Paper (hereinafter referred as “this report”) is written for the primary target readers of:

- Municipalities and business entities willing and planning to take initiatives in Smart City
- All the business entities with the intension of providing Smart City related services
- Ministries, business entities, and academia evaluating the visions of Smart City in Japan

with the objectives of:

- Establishing the references regarding which set of definitions should be made and also how for the regions and municipalities which are intending to venture into or expand Smart City efforts, by presenting necessary constituents to promote Smart City not only from the system aspects but also including the viewpoints of strategies and organizations.
- Allowing efficient delivery and exchange of services and data among interlinked Smart Cities by defining City Operating System (hereinafter referred as “OS”) as the foundational mechanism of Smart City and further formulating the minimum

set of rules for exchanging data as well as authentication (as API requirements) on City OS.

It is hoped that Japan will become the leading nation of Smart City through efficient development of Smart City in many regions based upon this report.

1.1 Definitions of terminology

Table 1.1-1 shows the meanings and definitions of the terms related to Smart City. The following definitions are assumed when these terms are used in this report.

Table 1.1-1 Functional overview of City OS

Term	**Definition**
Society 5.0	A human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space. (Cabinet Office)
Smart City	A holistically optimized, sustainable city or district where management (planning, building-up, management/operation, etc.) is executed leveraging such advanced technologies as ICT for the resolutions of various issues of the city. (Ministry of Land, Infrastructure, Transport and Tourism)
Architecture	In general, descriptions of “The relationship between the system and the outside world” and “Relationships among the components which constitute the system” to achieve a specific objective.
Smart City Reference Architecture (RA)	The architecture prescribed in this report which is to be referred by those who intend to implement Smart City, in order to confirm the necessary components required for the implementation and the relationships between them as well as required relationships with outside the Smart City.
City OS	The collective term for IT systems that facilitate easy implementations of services for various fields of Smart City by integrating commonly used functions by Region s which intend to implement Smart City.

1.2 Types of elements defined in Smart City Reference Architecture

Figure 1.2-1 shows types of elements defined in Smart City Reference Architecture.

As Smart City is promoted to resolve existing regional issues which vary greatly from region to region, their resolutions are also expected to require different approaches, hence it is difficult to uniquely define the components of Smart City.

In that regard, it is understood that multiple types of components which comprise Smart City Reference Architecture should be defined depending on the level of demand. The following three types are defined accordingly, namely, “Option-presenting type” which allows a selection of various functions from the list of requirements categorized by use case examples according to the issues to be resolved by each region and their future vision to aim for, “Framework-based type” which shows the framework regarding how to think and approach, and “Recommendation/exemplification-based type” which shows examples of common or recommended models as references and enables determination of the optimum model for the region.

As it is not possible to establish a nation-wide universal solution that ensures success of Smart City, primary promoters of Smart City are encouraged to determine the optimum model or style for their own region through referencing this report.

Type of element	Description of type	Primary target element
Multiple-choice based	• A type which presents multiple-options of requirements necessary to fulfill the characteristics of City OS, and as a reference for primary promoters of Smart City, without specifying the actual implementation methods. Example) Various functions and API etc. for City OS	Function/data/ data federation (City OS)
Framework based	• A type which presents the framework to assist primary promotors of Smart City, without specifying the actual implementation methods Example: how to devise grand strategy, etc.	Strategy/ Organization/ Business/ Rules
Recommendation/ Exemplification based	• A type which presents examples of common or recommended models to primary promotors of Smart City, as it is expected to be different depending on the regional characteristics despite its importance. Example: business model etc.	

Figure 1.2-1 Elements defined in Smart City Reference Architecture

1.3 Issues with Smart Cities in Japan and their ideal forms

Social issues that are structurally problematic such as a declining birthrate and aging population, declining productivity, impoverished regional economies, along with excess concentration in the Tokyo Metropolitan area and slow progress in digitalization, are increasingly becoming apparent. Converting a region into Smart City actively adopting digital technology is one of the most promising means to sustain and vitalize vibrant regions by improving productivity while resolving regional issues. Transforming a region into Smart City is more specifically the actualization of citizen-centric and sustainable region operation through cost reduction, improved productivity and added value by way of digitalization. In order to achieve them nation-wide, Smart City architecture, a blueprint, that promotes smooth and efficient implementation of Smart City is considered to be a must.

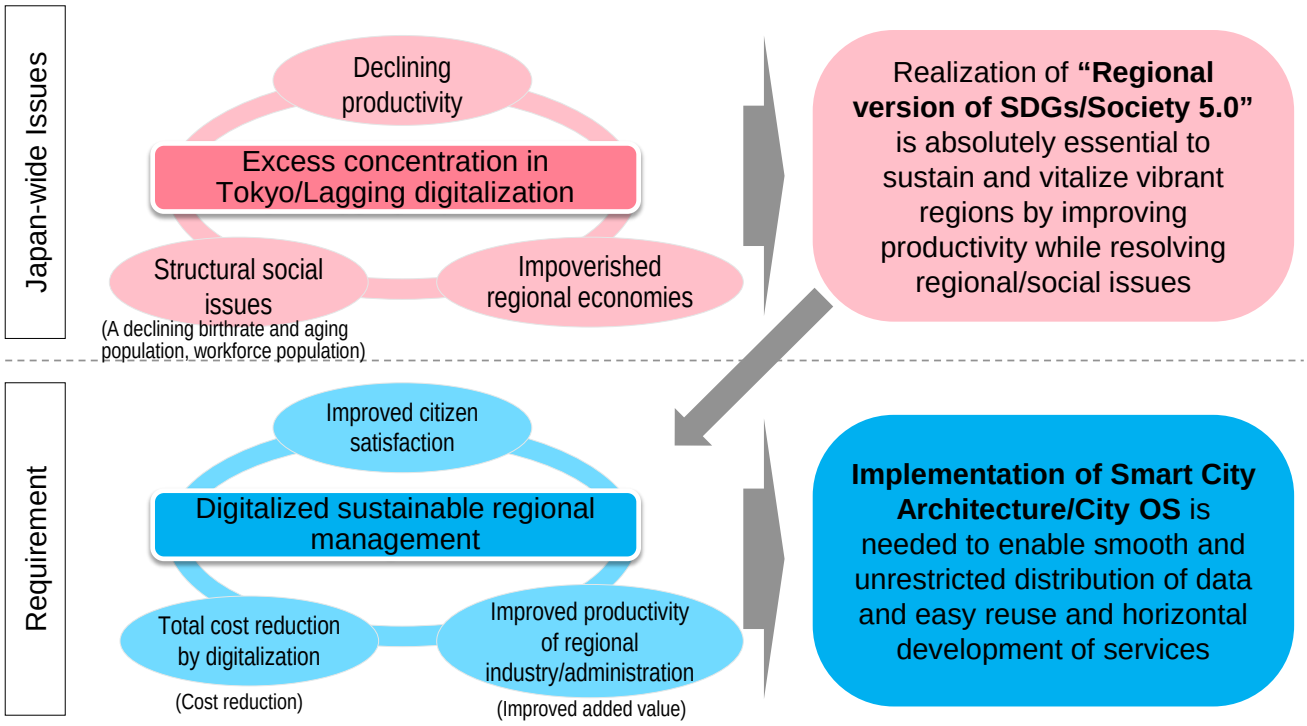


Figure 1.3-1 Current status and issues in Japan

2. Smart City Reference Architecture

2.1 Relationship with Society 5.0 Reference Architecture

This report defines the reference architecture (Smart City Reference Architecture) to be referred by primary promoters of Smart City and other related stakeholders in constructing Smart City services, while specifying components of each layer in accordance with use cases and the ideal form of Smart City based on Society 5.0 Reference Architecture defined by Cabinet Office as the basis.

Figure 2.1-1 shows items to be defined in Smart City Reference Architecture.

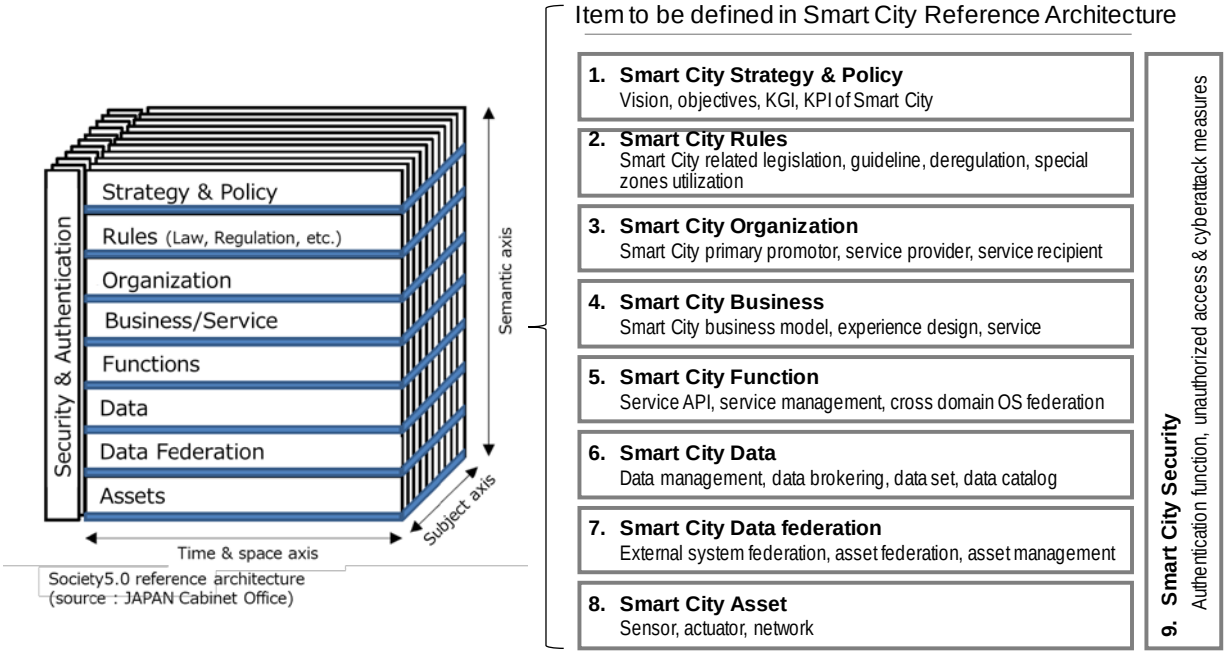


Figure 2.1-1 Items to be defined in Smart City Reference Architecture

2.2 Overall picture of Reference Architecture and four basic concepts

Smart City Reference Architecture is constructed with the following four basic concepts that are important for the promotion of Smart City.

1. All participants in Smart City project must always be aware of the users of Smart City services in their efforts to work on Smart City (User-centricity principle)
2. To maintain sustainable management of Smart City, a city-wide governance and management mechanism is needed (Role of City management)
3. By provisioning Smart City services via City OS, data and services must be federated efficiently without obstacles (Role of City OS)
4. To efficiently advance Japan-wide Smart City implementation, securing interoperability with other regions and systems is needed (Importance of interoperability)

Participants in Smart City, in particular primary promoters of Smart City, are strongly advised to proceed with Smart City initiatives bearing these points stated above in mind and considering the relationships between the components of Smart City mentioned later. Figure 2.2-1 shows a diagrammatic overview of the Smart City components and their inter-relationships as described in this report.

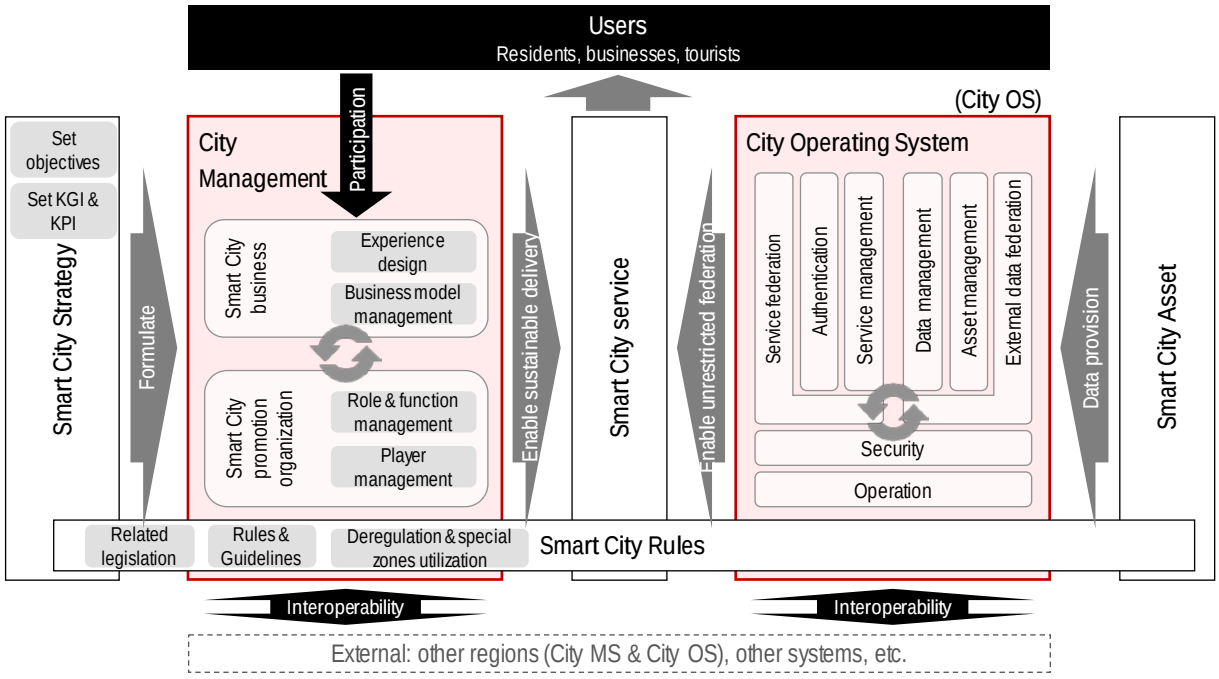


Figure 2.2-1 Overall picture of Smart City Reference Architecture

Users will enjoy the benefits of Smart City transformation by using various Smart City services. Two essential factors supporting such services are City management and City OS.

If City OS should only be implemented as IT systems without functions equipped in the region to manage the entire Smart City (City management), it would be difficult to realize Smart City transformation with a sense of inclusiveness and a sense of direction. On the other hand, if City OS should not be implemented at the right time, services and data would become fragmented resulting in an inefficient Smart City transformation of the region and also for Japan as a whole.

Therefore, “City management” and “City OS” are like two wheels on an axle for the promotion of Smart City, and Smart City transformation in its true sense is difficult without one or the other.

As an additional note, as regard to Smart City rules, their positioning has been changed to encompass all the components as there are rules to be set for each component of even the same field or theme, and it is important to maintain and manage them in a systematic manner across all the elements for the promotion of Smart City.

Each one of the four basic concepts are described in 2.2.1 through 2.2.4 below.

2.2.1 User-centricity Principle

One of the most significant characteristics of the overview of Smart City Reference Architecture is that users are positioned at the center and as the highest priority.

Irrespective of which regions or what fields of Smart City are being considered, it is understood that the primary objective is for such Smart City users as residents and visitors of a particular region or businesses and the like which conduct economic activities in the region to enjoy convenient and comfortable life and activities. For that reason, all those who are associated with Smart City must be aware of user-centricity principle in their respective effort.

Although it seems obvious, as services which are not paying sufficient attention to the users, there occasionally exist currently for example, services whose user interface is difficult for the users to understand without instructions on how to use, those which are left operating in the form originally released without any improvements reflecting the user comments, or those which are not frequently utilized after implementation due to lack of effective publicity and promotion.

It is understandably difficult to implement and maintain all the services in a perfect form as there are certain services which must be maintained as administrative services despite relatively low rate of usage, or there may be certain problems of budgetary restrictions on how to maintain and operate. At any rate, being aware of the user-centricity principle is still absolutely essential and sharing it as common attitude amongst those who are working on Smart City is a foundation for the region to move forward towards the ideal form of Smart City.

Specifically, those areas which are closely related to the user-centricity principle are “5.2.4 Experience design” of “5.2 Smart City business” for the construction of services from user’s perspective, “5.1 Smart City promotion organization” for forming an organization which focuses on appropriate adoption of opinions from the users and the region, and “7.2.1 Service Federation” of “7 City OS” which provides interfaces and functions required for user-friendliness conscious Smart City services.

2.2.2 Role of City management

The central role of city management is the overall and comprehensive management of Smart City in the region. Figure 2.2-2 illustrates the role of City management.

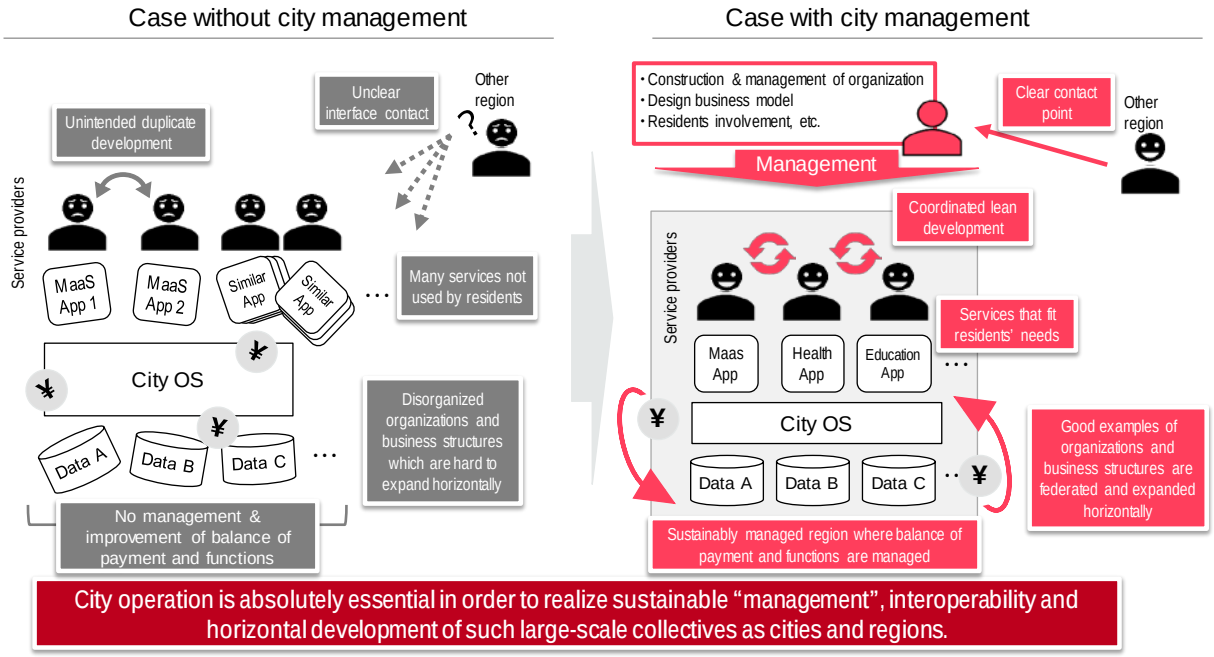


Figure 2.2-2 Illustrated role of City management

If Smart City in the region is not implemented with the holistic and comprehensive management, it causes various issues like;

- Unintended duplicate development within the same region
- Development of unused applications and the like due to mismatching with the resident's needs or lack of recognition
- Resulting in huge cost burden due to uncoordinated development of services and even without consideration of business models
- Collaborations with other regions or between public and private sectors are difficult due to unclear information on point of contact or person in charge

These issues could even become obstacles for further and expanded development of Smart City.

A business model is required to provide services in a sustainable and stable manner, and it is necessary to design services taking user's experiences in mind (Experience design) to provide services which are easy to use for users. Furthermore, it is also

necessary to establish Smart City promotion organizations in the region to manage the entire Smart City not only to provide services but also to instill a sense of unification in the Smart City initiatives of the region.

By implementing and having such functions to holistically manage the entire region (City management), it instills a sense of togetherness and unity in the overall Smart City initiatives of the region while enabling efficient promotion of Smart City for the users as well as service providers.

2.2.3 Role of City OS

The central role of City OS is to realize that services and data are well shared and federated like seamless & streamline flow. Figure 2.2-3 illustrates the role City OS plays for that purpose.

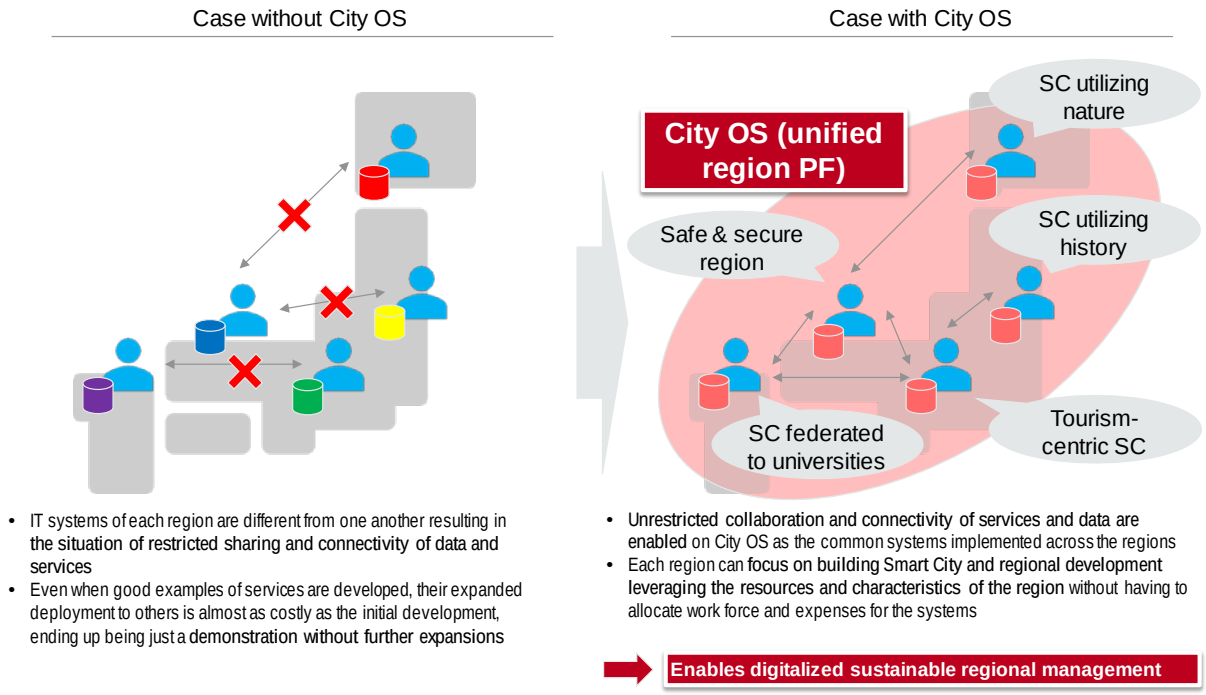


Figure 2.2-3 Smart City society realized by City OS (Role played by City OS)

In the case where City OS is not yet in widespread use, IT systems across the regions are fragmented and services and data are not well shared and federated like seamless & streamline flow across the regions. Because of that, even when a good service is developed, its horizontal expansion becomes almost as expensive to implement as the initial development, and as a result, it often ends up in a situation where many different systems exist all over the place.

On the other hand, in the case where City OS, which is a region platform based on unified rules, is implemented across the regions, sharing and federation of services and data within and outside the regions are enabled as a result of ensured interoperability based on common rules specified by City OS. Each region will require less work force and expenses for the systems in comparison to the situations without shared City OS, and as a result, they can focus on a variety of promotions of Smart City and regional development taking advantages of the resources and characteristics of the region.

2.2.4 Importance of interoperability

As Smart City services based on user's perspective are expected to reflect the characteristics of the local region to a certain extent, the specifics of the services are not necessarily uniform across the nation. Therefore, Smart City transformation is expected to proceed region by region of a certain size although its boundary may not exactly match with the local government boundary.

However, cross domain mobilization of relocating residents as well as tourists are to be expected, and also companies may certainly conduct business in multiple regions. Having to register new data or supply and store the same kind of information repeatedly in multiple Smart Cities is not only inconvenient for users but also an evidence of lack of Japan-wide optimization.

In addition, the inefficiency resulting from each region developing similar services from scratch independently from other regions without being able to replicate the services already in operation in other regions has already been stated under "2.2.3 Role of City OS".

In order to enable replication of existing services and let multiple regions utilize them, such systematic interoperability mechanisms such as common APIs to be enabled by City OS are necessary as stated earlier. Furthermore, from the standpoint of City management, it is also necessary to organize the rules (terms of use, usage fees, etc.) of horizontal deployment of services for external access, and set up a point of contact for external collaborations and inquiries to enable open communication.

In order to achieve efficient Japan-wide Smart City transformation, it is necessary to construct an environment in which data and services are well shared like seamless & streamline flow. As it could only be achieved with City OS taking a role of the systematic interoperability and City management taking a role of the human Interoperability function. Therefore, interoperability should be promoted respecting both City management and City OS as two wheels on an axis.

2.3 Components summary of Smart City Reference Architecture

Figure 2.3-1 shows a summary of components of the Reference Architecture. In chapter 3 onwards, specific details of component elements and the ideas behind them are described in the respective chapters.

It should be noted that each component is not independent from each other but influences each other. Therefore, when designing individual components of Smart City, it is necessary not only to examine each component one by one, but also to consider the constraints and impacts coming from other components as appropriate.

Relationship with other components which should be mainly considered for each component will be explained at the beginning of each chapter.

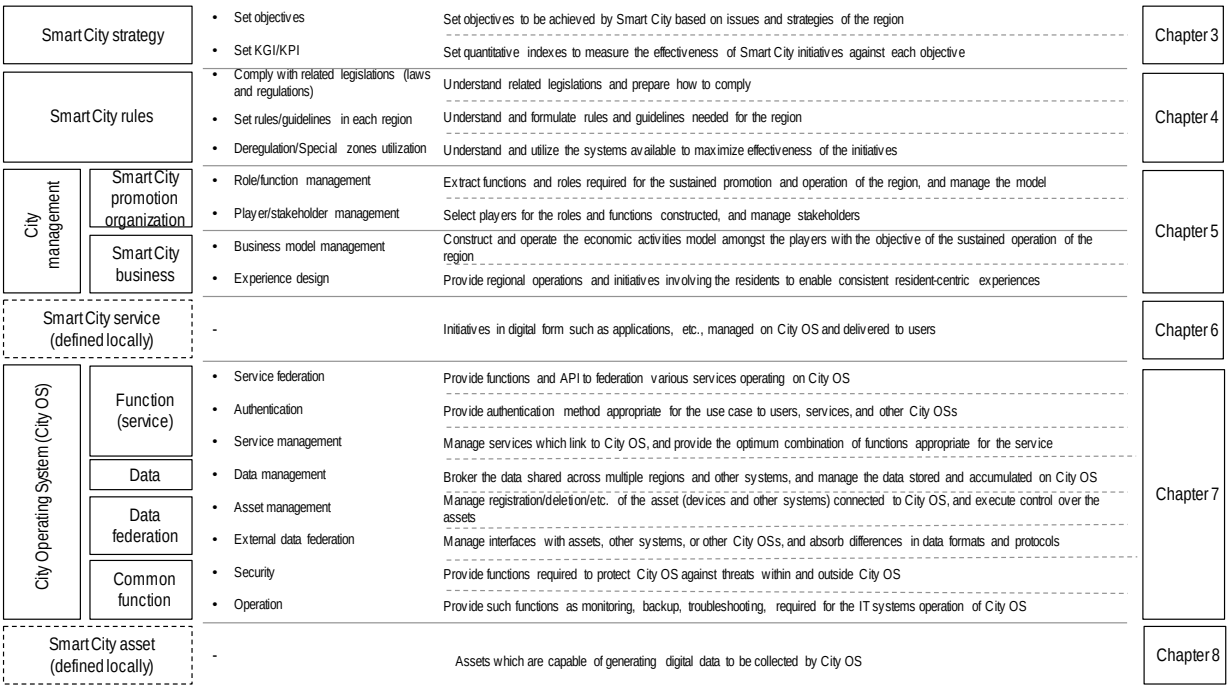
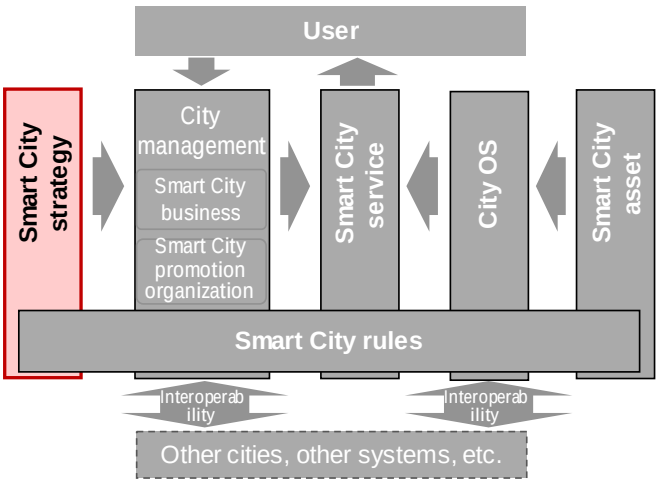


Figure 2.3-1 Components summary of the Reference Architecture

3. Smart City Strategy

3.1 Positioning of Smart City Strategy



In Smart City, “strategy” describes the roadmap of how each region achieves its goals. By formulating strategy, the whole structure of Smart City including services, organizations, systems, etc. which are in line with the strategy can be structurally and efficiently constructed in line with the strategy. Although formulating strategy itself is mandatory, as its content should be different from region to region, only the framework of formulating strategy is presented in this chapter. By way of this framework, Smart City goals based on the regional issues are organized hierarchically and it leads to the implementation of the measures and provision of services.

While Smart City strategy should be formulated based on all the components of the region, all these components should also be developed and managed based on the Smart City strategy. In particular, as regard to Smart City service, a development method to reflect the strategy is described in “5.2.4 Experience design”. It is also necessary to pay attention to possible mismatch with the strategy when considering Smart City organization, Smart City business, Smart City asset, Smart City rules, and City OS, respectively.

3.2 Framework to formulate strategy

The framework to formulate strategy as defined in the reference architecture is broadly classified into goals as the central components, and KGI and KPI as quantitative representations of the level of achievement of such goals. “Major goals” are determined reflecting the issues of each region, and the hierarchy structure of goals are organized all the way down to “sub goals” at the base. KGI corresponds to each major goal, and KPI to other lower goals and measures. Figure 3.2-1 shows the structure.

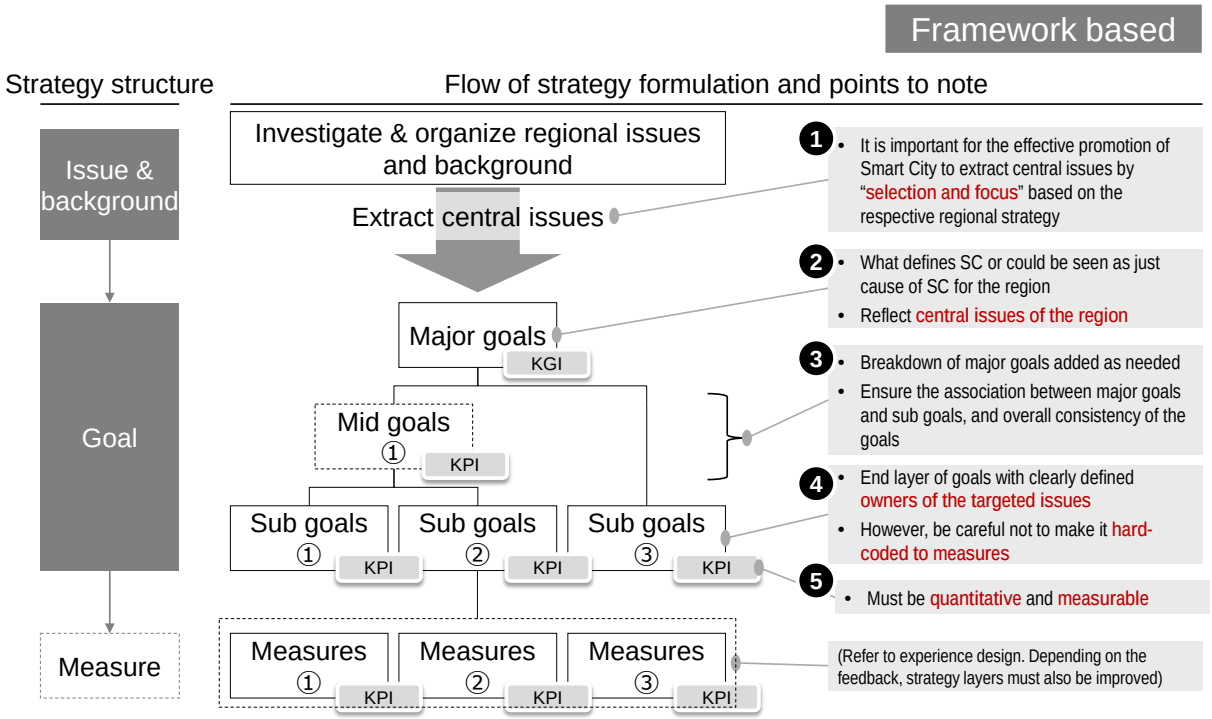


Figure 3.2-1 Strategy formulation process and points to note

1) Extracting central issues

Prior to determining goals to be achieved by Smart City, it is necessary to sort out the issues and background of the region. For that purpose, it is necessary to grasp the overall picture of the regional issues sorting out the issues from various viewpoints without getting constrained by the existing plans and the like. In addition to the issues, it is also important to understand various assets that the region possesses and could be leveraged. They could be, for example, education and research institutions, major industries, tourism resources such as history, culture, cuisine, nature, events, and famous people, which

could be generally regarded as strength when describing the region. It is also effective to hold workshops with residents and the like as needed.

Having sorted out the regional issues and background, it is necessary to select the central issues to be resolved by Smart City. The central issues should be determined with concept of “selection and focus“ in mind while considering what issues should be resolved by Smart City which is the regional strategy utilizing ICT, and whether the issues are at an appropriate magnitude as the issue for the whole region or not, etc.

It should be noted that although it is important to limit the number of central issues to a manageable number as a result of “selection and focus “, it does not necessarily have to be narrowed down to one.

2) Determination of major goals

Once the central issues are determined, corresponding major goals are determined next. They should be recognized as just cause of the Smart City defining what purpose it should serve in the region and what to achieve. It is the most important decision from the standpoint of sharing common understanding among people involved in Smart City, facilitating better communication with a unified message to outside the region, and furthermore ensuring Smart City strategy with a sense of unity in gradually substantiating the goals starting from it. KGI corresponding to the major goal will be described later. The magnitude of the major goals and KGI should be determined by referring to, for example, “3.3 Categorization and examples of major goals”. If there are multiple central issues, there should be corresponding number of major goals.

3) Breakdown of major goals (mid goals)

As it is necessary to break down the determined major goals into specific sub-goals described later, it would be effective to organize the goals in a hierarchical manner so that anybody could understand the association and the logic behind them. Mid goals set as needed are the layers which create the association between the major goals and sub goals to ensure overall consistency of the goals and the storyline. Therefore, there could be multiple layers and not necessarily limited to one as long as the breakdown of the goals are appropriate for the region.

4) Determination of sub goals

Sub goals are positioned at the end layer of all the goals as the major goals are broken down into specific goals. The end layer is defined in such a way that each sub goal after breakdown can be represented by a clearly defined owner or a stakeholder of the targeted issue.

The owner of the targeted issue is the beneficiary of the measures designed to achieve these sub goals and, in the case of services, they are people and businesses who use the services. There could also be some goals of which beneficiary might be non-human like environment and industry. In these cases, the stakeholders who could be affected by these goals need to be identified.

One thing to note here is that the definition of sub goals must not be mixed up with the definition of measures. The sub goals are nothing but the status to aim for, in other words, the results. Those specific methods to realize them are the measures.

5) Setting KGI and KPI

KGI and KPI must be set for the major goals and other subsequent goals as well as the measures. It is in effect a “yardstick” to evaluate the effectiveness of the measures, or the level of achievement of the goals.

Therefore, KGI and KPI should define quantitative elements which are measurable. In the measurement, it is also necessary to set the numerical goals to specify the scale of the “yardstick” rather than using such abstract definition as “increase”. It should also be noted that, to be effective, they must be directly linked to the outcome. For example, it should not be like “distribute XX pieces of fliers related to ZZ” but instead it must be like “increase the awareness amongst the citizens of ZZ by XX%” as the target value of the outcome.

More explicit and logical goals could often be defined by setting KGI/KPI at the same time as the goals as the specific outcome of them.

For each sub goal, it is ultimately necessary to implement specific measures as the methods to achieve them. Please refer to “5.2.4 Experience design” for more details.

3.3 Categorization and examples of major goals

Having understood the issues and background of the region, the biggest goal to achieve via Smart City transformation of the region is the “major goal” which must not be too abstract nor too specific to be the goal of a Smart City which is equivalent as the regional strategy.

For example, if the major goal was “regional development for citizens to lead lively life”, it could not be a unified goal of the region as the expectation of Smart City would vary greatly from person to person. On the other hand, if the major goal was “increase the consultation rate of health checks”, the expectation could be too specific and small for the goal of Smart City as the regional strategy.

As a reference, Figure 3.3-1 shows examples of three categories of themes for major goals based on the actual examples of domestic and overseas Smart Cities. It consolidates the related issues in reference to the frequently selected themes of regional strategy. Each region is expected to investigate and indentify these “central subjects” and “central issues” based on the regional strategy, and then relate them to major goals shown as examples. It should be noted, however, that they merely represent general trends and it is not necessarily required to fit into such a framework.

		Recommendation/ Exemplification based	
	regional strategy theme example 1	regional strategy theme example 2	regional strategy theme example 3
	Attract, retain and train people through support	Secure quality and quantity of employment and economic development	Enhance and invigorate regional functions/environment
Central subject example	Health, education, personnel, tourism	Promote industries, industrial productivity improvement, agriculture, work practice reform	Energy, environment, disaster prevention, infrastructure, security
Central issue example	• Declining population & falling birthrate and aging population • Outflow of younger generation • Few incomers/tourists (interaction/stakeholder population)	• Few companies (jobs) • Lack of uniqueness/appeal of industries • Low productivity/low wages	• Increasing cost burden for infrastructure management • Difficulty in transportation/exchange • Insufficient safety/disaster response
Major goal example (KGI example)	• Increase work force population (population target of XX people) • Improve resident’s QoL (improve resident approval index by CC%) • Realize healthy region (increase healthy life expectancy by XX years) • Personnel training (train XX people of XX personnel) • Attract tourists (annual tourist of XX people)	• Promote industries (establish XX companies of XX industry) • Productivity improvement (Improve local company’s profitability by XX%) • Work practice reform (Improve worker retention by XX%) • Promote public administration (Create XX projects)	• Safe/secure regional development (increase resident approval index by XX%) • Green regional development (annual CO2 emission of XXtons) • Disaster resilient regional development (improve disaster risk index by XX%)

Figure 3.3-1 Categorization and examples of major goals

3.4 Example of Smart City strategy

In this chapter, the strategies of the regions which are already proceeding with Smart City are presented as examples following this reference architecture and described as examples. They should be used as references by each region in formulating the strategy.

3.4.1 Strategy of Aizu-Wakamatsu-city

Aizu-Wakamatsu-city has formulated the "7th Aizu-Wakamatsu-city Comprehensive Plan" as the primary regional plan, and presents “Smart City Aizuwakamatsu” in “Towards ever-connected region” which is one of the concepts that runs through the entire plan. In addition, the "General Strategy to revitalize Region/People/Jobs in Aizu-Wakamatsu-city", which summarizes the measures and projects to be strategically pursued among the ones contributing to the revitalization of local regions, includes many initiatives that utilize ICT.

Figure 3.4-1 shows the structural organization of the strategy of Aizu-Wakamatsu-city[1] which is promoting “Smart City Aizuwakamatsu” and actively pursuing the utilization of ICT in various fields.

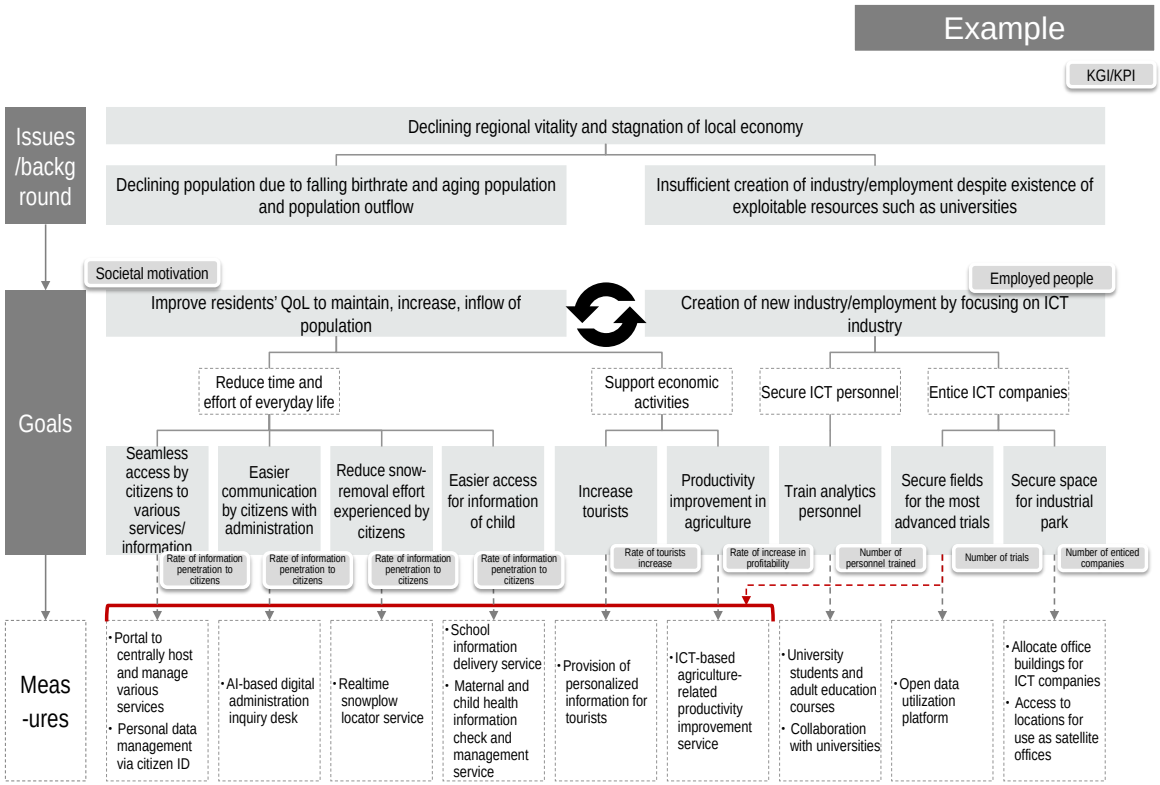


Figure 3.4-1 Strategy of Aizu-Wakamatsu-city

[1] Strategy of Aizu-Wakamatsu-city: Created based on the information provided by Aizu-Wakamatsu-city

Aizu-Wakamatsu-city was aware of the risks associated with over-dependence on the traditional methods of only inviting factories, etc. in aspiring to become a dynamic and sustainable region, owing to the problem of declining population, in particular of work-force population. On the other hand, as a result of reevaluation of the regional resources of Aizu-Wakamatsu, the presence of Aizu University with the uniqueness as ICT-specialized university, in addition to existing industries like tourism and agriculture, has helped to determine the direction of focusing on the build-up of ICT industry as an emerging industry. Along with that, aiming to improved retention rate of the people newly moving into Aizu-Wakamatsu-city as well as of those who are already regional residents, the improvement in citizen's convenience has been established as one of the major goals.

Among various mid goals and sub goals set to achieve these major goals in Aizu-Wakamatsu-city, for example, the goal like "Seamless access by citizens to various services/information" is an example which can be a good reference to other regions.

In the case of Aizu-Wakamatsu-city which had set the focused build-up of ICT industries as one of the major goals, it had also set a clear direction to utilize ICT in achieving the other major goal of improving citizen's convenience.

Therefore, two major goals are not independent from each other, and even at the level of measures, there are many cases which are associated with both of the major goals. Specifically, they are shown by red arrows in Figure 3.4-1 and represent the fact that setting up of the portal and common IDs to enable "Seamless access by citizens to various services and information" mentioned above and each one of other specific measures could concurrently contribute to inviting CT companies as the foundation of "fields for the most advanced trials".

These strategies are positioned as the "Smart City Aizuwakamatsu" initiatives, and their understanding is constantly confirmed, discussed, and shared by the Aizu Region Smart City Council which is mainly comprised of the city government and local companies and with the aim of promoting and realizing "Smart City Aizuwakamatsu". As a result, various measures are being promoted with a sense of direction of the whole region.

3.4.2 Strategy of Takamatsu-city

Figure 3.4-2 shows the structural organization of the strategy of Takamatsu-city[2].

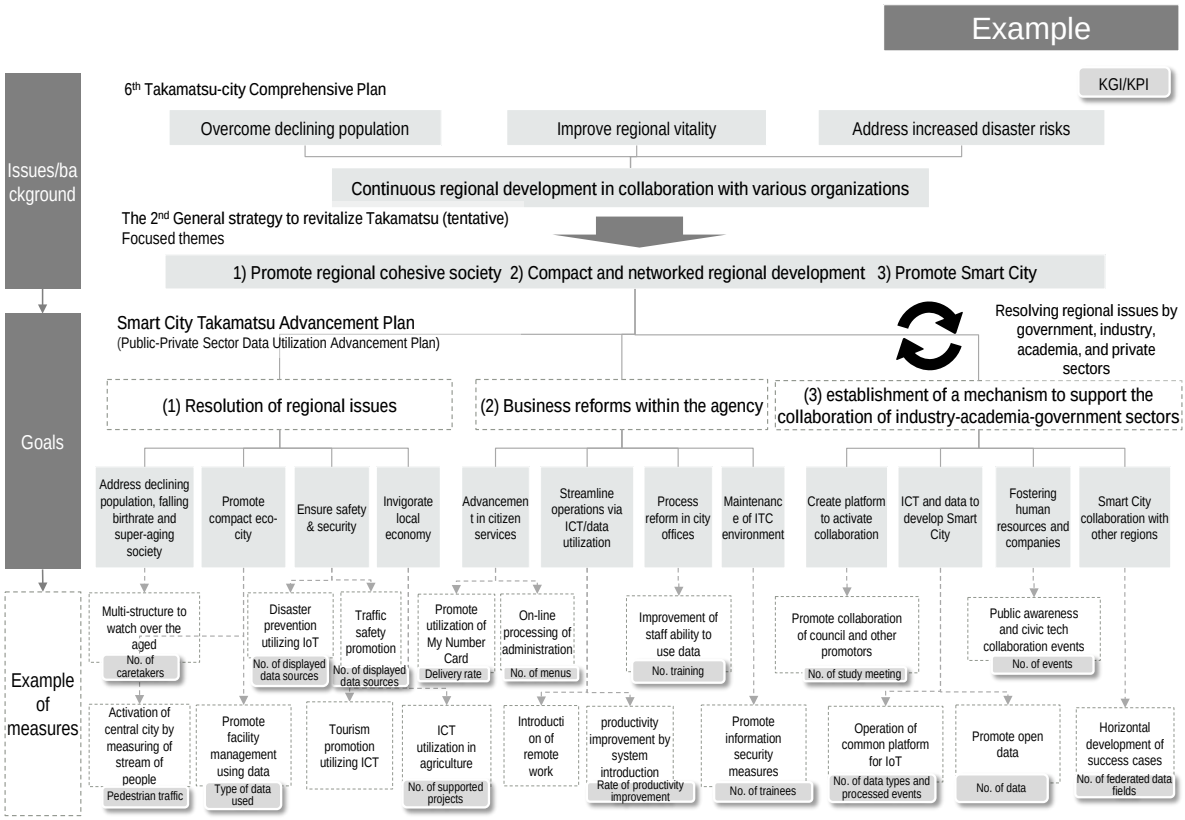


Figure 3.4-2 Strategy of Takamatsu-city

With the common understanding of overcoming declining population, improving regional vitality, and addressing increasing disaster risks, Takamatsu-city has set “The town where polity can show the power together with a suitable town citizen ” in order to address various issues which cannot be resolved by the local government alone, as one of the major goals of the “The 6th, Takamatsu City general plan ”. In addition, it has established the “2nd General Strategy to Revitalize Takamatsu (tentative)” as a specific initiative to address the important issue of “society with declining population”, and positioned Smart City advancement as the priority theme of the strategy.

It has established the “Smart City Takamatsu Advancement Plan” as general guidelines for ICT policies aiming at achieving the higher-level goals and strategical goals, and set mid and sub goals and the measures for them along with KPI. This plan itself has also been established as the "Basic Plan for the Advancement of Public and Private Sector Data

[2] Strategy of Takamatsu-city: Information source: Takamatsu-city

Utilization" with three main measure systems: (1) resolution of regional issues, (2) Operation reorganizes within the local government, and (3) establishment of a mechanism to support the collaboration of industry-academia-government sectors, along with their respective measure and corresponding KPI.

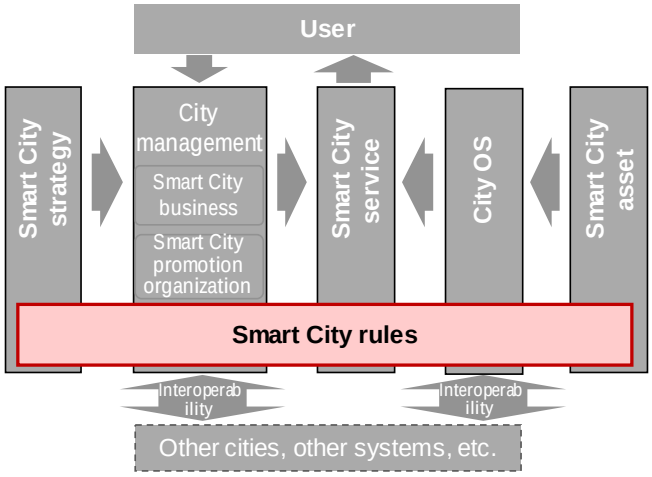
What characterizes the approach in Takamatsu-city is that it is not just the local government which promotes the initiatives for these mid to sub goals and measures, but “Smart City Takamatsu Promotion Council” with participants from various organizations in industry-government-academia-civic sectors is established to proceed with the initiatives to resolve the regional issues in collaboration with the members of this Council going beyond the framework of the government.

For example, with respect to “Ensuring Safety & Security” stated in the “Smart City Takamatsu Advancement Plan” as shown in Figure 3.4-2, “Promotion of disaster prevention utilizing IoT” is set as the measure, and in order to enhance the collection of data utilized for well-coordinated responses and communicating information to residents in the event of a disaster, the number of data sources displayed on the IoT common platform is set as the KPI. Specifically, through activities in collaboration with “Smart City Takamatsu Promotion Council”, various studies are being conducted on the initiatives to capture and utilize the camera images of flooding status of city road underpasses and geospatial map showing locations where water and tide level sensors implemented, and how to utilize the data related to the status of social infrastructure such as roads and power grids as well as the water level data of reservoirs, etc.

As described here, Takamatsu-city is proceeding with the promotion of Smart City measures making progress in the resolution of regional issues by way of the strategies and goals set by the government and the collaborative activities of industry-government-academia-civic sectors Council.

4. Smart City Rules

4.1 Positioning of Smart City rules



In implementing and operating Smart City plans and providing various measures and services, it is certainly necessary to comply with the relevant laws and regulations set forth by the Government. However, in order to promote Smart City more effectively and provide services from the user's perspective, it is also important to formulate and operate appropriate rules for the operation of Smart City organizations and the provision of services in each region. Furthermore, in order to provide new services in response to social demands, various regulations are often found to be relevant, and deregulation and the like turn out to be useful.

In Smart City plans, it is important to understand "relevant laws and regulations", "codes and guidelines set by each region", "utilizations of deregulation and special zones system, and revision of the laws" as components of the rules, as shown in Figure 4.1-1.

As "relevant laws and regulations", there are laws and regulations enacted in the fields of transportation and energy, and in the case of handling personal information in the provision of services, Act on the Protection of Personal Information and relevant ordinances of the municipalities.

As "codes and guidelines set by each region", there are codes for operating organizations which set forth such operating rules for the primary promotor organization of Smart City as objectives, project implementation, and decision-making method, and the terms of services which specify operational instructions, conditions of use, and handling of personal information to users.

As "utilizations of deregulation and special zone system, and revision of the laws", there are utilization of special zones system established by the Government and revision of the laws which are being considered or implemented in various fields in response to social demands and technology advancement.

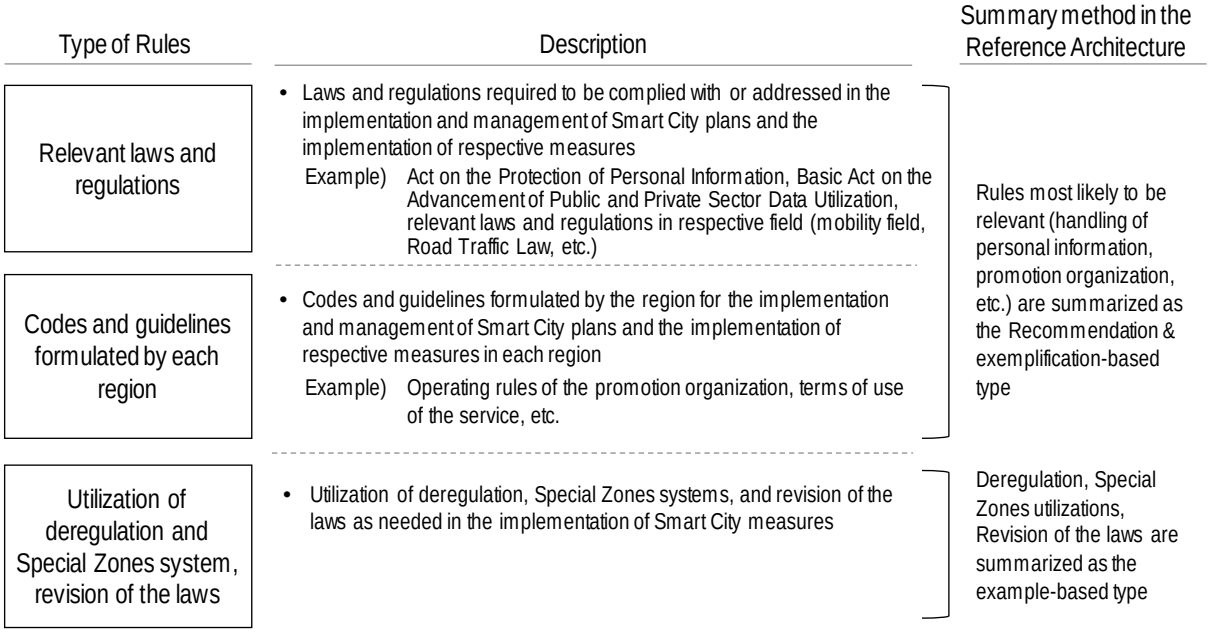


Figure 4.1-1 Components of Smart City rules

4.1.1 Relationship between the classification of Smart City rules and other components

Smart City rules can be classified according to the subject matter of the rules into rules for the promotion of Smart City plans (service provision) and rules for data handling. The rules for data handling are further classified into the handling of personal data and open data, etc.

Figure 4.1-2 shows the relationship between the classification of Smart City rules and other components. For other components (Smart City strategy, City management, Smart City service, City OS, and Smart City asset), the relevant laws and regulations, as well as codes and guidelines formulated for promoting Smart City in each region are set. In that regard, on this reference architecture, Smart City rules can be seen as possessing cross-domain relationships with each of the other components.

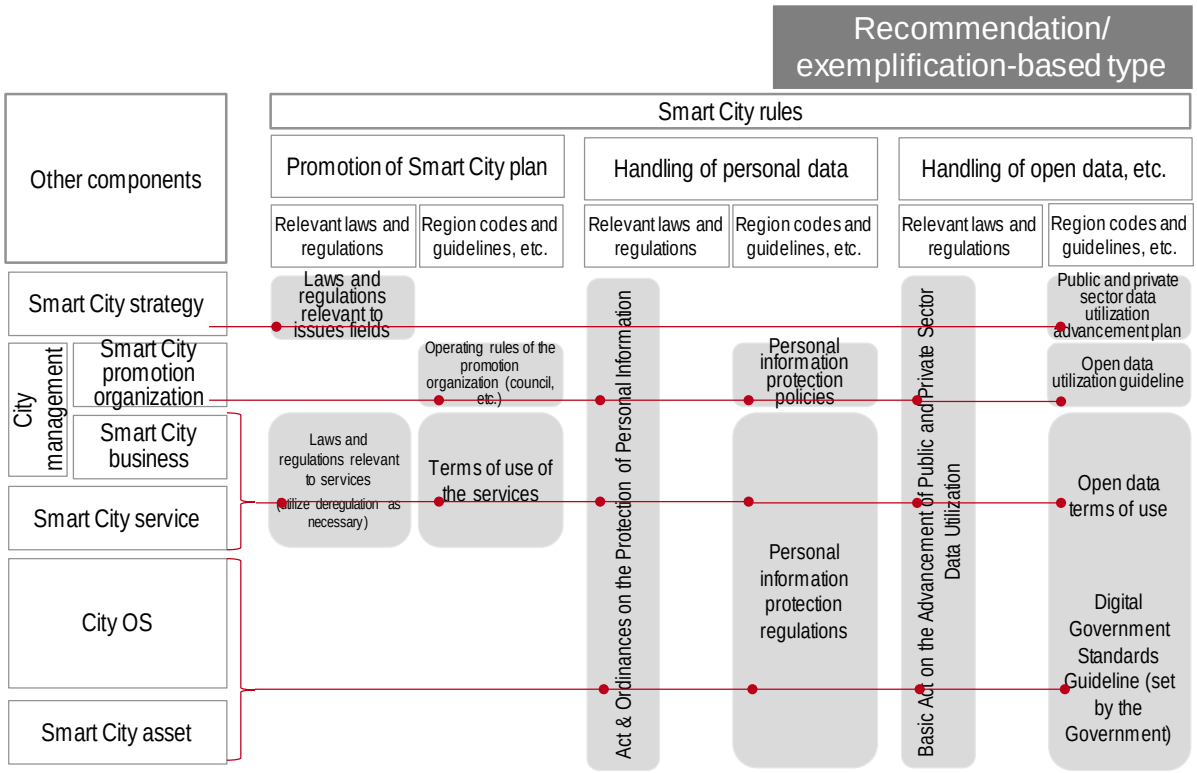


Figure 4.1-2 Relationship between the classification of Smart City rules and other components

The figure comprehensively shows the components of Smart City rules in a recommendation/exemplification-based type. In practice, there will be differences in the components for each individual case, depending on the services implemented in each region and the types of data handled (personal data, open data, etc.).

4.2 Laws & regulations, and guidelines

Specific content of the components is organized according to the classification of Smart City rules shown in Figure 4.1-2.

4.2.1 Rules for the promotion of Smart City plans

Rules for the promotion of Smart City plans include the following.

- Relevant laws and regulations for the areas of issues and the areas of implemented services
- Rules for Smart City promotion organizations (operating rules of the promotion organization, etc.)
- Rules for implemented services (terms of use of the service, etc.)

(1) Relevant laws and regulations for the areas of issues and the areas of implemented services

With respect to relevant laws and regulations for the areas of issues and the areas of implemented services, various laws and regulations are enacted in each of the areas, and it is necessary to comply with the relevant laws and regulations when implementing services. Table 4.2-1 shows some examples of relevant laws and regulations by the areas.

As an example of verification experiments utilizing new technologies, public road verification experiments controlled by remote autonomous driving system have been conducted within the framework of Road Trucking Vehicles Act (approval of deregulation of standards based on Article 55 of Safety Standards for Road Trucking Vehicles[3]) under the condition that such safety measures as speed limit and limited driving routes are implemented for vehicles which are not equipped with a steering wheel or accelerator/brake pedals. The National Police Agency has also responded by formulating "Standards for Permission to Use Roads for Public Road Verification Experiments of Autonomous Driving[4]".

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[3] Source: http://www.mlit.go.jp/common/001229341.pdf

[4] Source: https://www.npa.go.jp/bureau/traffic/selfdriving/20190905jidouuntenkyokakijyunkaiteiban.pdf

On the other hand, for the implementations of Smart City measures and services, it is indispensable to have not only the legal framework but also support and cooper-ration of public administration for permits and licenses. It is also important to have such cooporations as quick turn-around for approval of deregulation of standards and permission to use roads in autonomous driving, and permission to occupy public spaces such as roads when sensors are installed.

Table 4.2-1 Examples of relevant laws and regulations

Area	**Relevant laws and regulations**
Traffic and mobility	Road Traffic Act, Road Transportation Act, Road Trucking Vehicle Act, Railway Business Act, Civil Aeronautics Act, etc.
Health and welfare	Medical Service Act, Long-Term Care Insurance Act, etc.
Energy	Electricity Business Act, etc.
Communication	Radio Act, etc.
Agriculture	Agricultural Land Act, etc.
Administrative procedures	Digital Procedure Act, etc.
Urban development	City Planning Act, Road Act, River Act, Urban Parks Act, etc.

(2) Rules for Smart City promotion organizations (operating rules of the promotion organization, etc.)

Smart City promotion organization are often formed comprising of multiple organizations in government, industry, academia, and other sectors. In order to effectively promote Smart City in the promotion organization consisting of multiple organizations, it is important to agree and share the regional issues and goals among the organizations which make up the organization, and operate the organization with a sense of unity and direction to realize the goals. In addition, in order to ensure smooth and fair decision-making in the organization, it is important to formulate decision-making protocols in advance as organizational rules.

Main subjects to be defined include objectives of the organization, projects to be implemented, organizational structure/meeting scheme, and decision-making processes of the organization, etc.

Table 4.2-2 Examples of rules for Smart City promotion organizations

Examples of rules (examples extracted from domestic use case research)[5]
Hirosaki-style Smart City Promotion Council Rules (Hirosaki-city)
Kyoto Big Data Utilization Platform Member Agreement (Kyoto prefecture)
Masuda Cyber Smart City Creation Council, Articles of Incorporation (Masuda-city)
Kashiwanoha Urban Design Center, Articles of Incorporation (Kashiwa-city)
Misono Town Management Council Rules, Misono urban Design Council Rules (Saitama-city)

(3) Rules for implemented services (terms of use of the service, etc.)

In implementing services, terms of use stating the conditions for the use of the service are formulated and disclosed to the service users, and then the service is provided with the consent of users.

Main subjects to be defined include conditions for service user, user registration, instructions for service use, prohibited matters, usage fees, handing of personal information, etc.

Table 4.2-3 Examples of rules for implemented services

Examples of rules (examples extracted from domestic use case research)
"Karada Medical Record" Membership Agreement, Shared Bicycle Terms of Use, Misono Parenting Style Bambi Terms of Use (Saitama-city)
Data Cradle - Data Analysis Salon Rules (Kurashiki-city)
Fujieda Kura-share Cloud Sourcing Site Terms of Use (Fujieda-city)
Guidelines for Achieving Stable Communications with Smart Buoys Operated at Sea (Higashi-Matsubara-city)
Fujisawa SST Town Design Guidelines (Fujisawa-city)

[5] Cross-ministerial Strategic Innovation Promotion Program (SIP) Second Phase, Big-data and AI-enabled Cyberspace Technologies / Smart City Architecture Development / Smart City Architecture Design and Promotion of Related Verification Research, Research and development subject (a-1) Smart City field: Directing the construction and verification research of the architecture, Use case survey report on Smart City in Japan

4.2.2 Rules for the handling of personal data

Rules for the handling of personal data include the following.

- Act on the Protection of Personal Information and relevant ordinances of the municipalities
- Rules for the handling of personal information in the promotion organizations (policy on the protection of personal information, privacy policy, etc.)
- Rules for the handling of personal information in the implemented services (rules on the protection of personal information, etc.)

(1) Act on the Protection of Personal Information and relevant ordinances of the municipalities

Act on the Protection of Personal Information sets forth the obligations which business operators must comply with in handling personal information, and the Smart City initiatives which handle personal information must also comply with this Act. When the regional rules for the handling of personal information are formulated, each region must also do so in accordance with the provisions of this Act.

Article 1 (Objective) of the Act states, "The objective of the Act is to protect the rights and interests of individuals with due considerations to the usefulness of personal information in that the proper and effective utilizations of personal information contributes to the creation of new industries and the realization of vibrant economic societies, and prosperous lives of the people" with the main message being "the proper and effective utilizations of personal information" assuming the protection of the rights and interests of individuals.

Additionally, each municipality across the country has formulated its own ordinances on the protection of personal information under the Act on the Protection of Personal Information. It therefore should be noted that there could be differences in the handling of personal information between municipalities when Smart City initiatives are developed as cross domain collaborations between municipalities.

(2) Rules for the handling of personal information in the promotion organizations (policy on the protection of personal information, privacy policy, etc.)

The rules define the basic policy on the handling of personal information by the promotion organizations, and are disclosed as the policy on the protection of personal information and privacy policy. This basic policy is regarded as the common policy on the handling of personal information by relevant organizations and also reflected in the rules for handling personal information in the implemented services.

(3) Rules for the handling of personal information in the implemented services (rules on the protection of personal information, etc.)

When formulating rules for the handling of personal information in implementing services, it is necessary to address it in accordance with the Act on the Protection of Personal Information and relevant ordinances of the municipalities.

The Act on the Protection of Personal Information stipulates the prohibition in principle of the handling of personal information beyond the scope necessary to achieve the purpose of use (Article 16), notification, publication, and clarification of the purpose of use when acquiring personal information (Article 18), deletion of the data when the handled data is no longer needed (Article 19), necessary and appropriate measures for the secure management of personal data (Article 20), and, the prohibition in principle of the provision of personal data to third parties without consent of the individual (Article 23), etc., and the rules must be formulated and operated in compliance with them.

When personal information is provided to third parties (for example, when personal data provided by the individual and managed by the promotion organization are provided to service providers), there are cases of obtaining consent from the individual and opting-out (when the individual requests to block the provision of the personal data which identifies the individual to third parties in such instances as responding by law. Excluding personal information requiring special care). (Article 23 of the Act)

As one of the methods to indicate the security measures for personal data adopted by the promotion organizations or service providers (Article 20 of the Act), the Privacy Mark system (upon receipt of assessment by a third-party organization, Privacy Mark is granted) could be utilized, and there are examples of promotion organizations utilizing this system.

Table 4.2-4 Rules for the handling of personal information and examples of implementation

Examples of rules (examples extracted from domestic use case research)
UDCMi Common Platform Saitama-version, Terms of Use (Saitama-city)
Under Personal Information Disclosure Procedure, Stored Personal Data Disclosure Request Form & Response Form (Kurashiki-city)
My City Report for Citizens, Terms of Use for Registered Participants, Guidelines for Disclosure (Chiba-city)
Optimization of Rules related to the Handling of Child Information (Yao-city)
Publishing Handbooks on Preventing Information Leakage targeted at Medical Institution Personnel and Care Agency Personnel respectively (Onomichi-city)
Fukuoka-city At-Home Collaborative Support System Verification Project, Implementation Outline, Terms of Use, etc. (Fukuoka-city)
Personal Information Risk Assessment (PIA) (Himeji-city)
Guidelines for the Handling of Data Required for Catch Forecasting (Higashi-Matsubara-city)

4.2.2.1 Rules for the operation of Mimamori Cameras (safety-care cameras) in Kakogawa-city (Ordinance on the installation and operation of Safety-care Cameras)

(1) Background of initiatives

In 2016, the number of acknowledged criminal law offenses per 1,000 of population in Kakogawa-city was 10.396, which was far above the average of 9.634 of those for all the cities and towns in Hyogo Prefecture, and the incidence of criminal law offenses was in a dire situation. At the same time, the increase in the number of elderly people living alone and those with dementia due to increasing life expectancy and falling birthrate and those with dementia was also becoming noticeable as the major regional issue for Kakogawa-city. The police and cooperating agencies were receiving messages concerning missing elderly people with dementia almost on a daily basis, sometimes as many as two or three cases of missing person a day.

Under these circumstances, the population of Kakogawa-city had been declining since the peak in December 2012, and there was a strong desire to develop region where the parenting generation could live and raise children with peace of mind, and where the elderly could continue to live their own life as deemed feasible in the region familiar to them. In response, Kakogawa-city established and introduced 1) “Safety-care Cameras

(1,475 in the city)" with the objectives of deterring crimes and early resolutions of incidents, etc., and 2) "Next Generation Safety-care Service (a public-private collaboration project)" to support the safety of children and the elderly and the families' peace of mind. Presented below are the rules of operation and some creative approaches for the "Safety-care Cameras" which require special cares to privacy and the appropriate handling of personal information due to an unspecified group of individuals photographed.

(2) Rules for the operation of Safety-care Cameras (Ordinance on the installation and operation of Safety-care Cameras)

There is no special law stipulating the installation and operation of security cameras in general, and it is currently left to the city to determine how to manage and operate the security cameras installed by the city. Kakogawa-city has enacted a new "Ordinance on the installation and operation of Safety-care Cameras" with the objectives of strict and proper management and operation of the cameras installed by the city. This ordinance stipulates and publishes installation purposes, methods of operation, restrictions on unintended use, restrictions on the provision to outside parties, non-disclosure, and publishing of the status of operation[6] In the operation of Safety-care Cameras, Article 6 "Restrictions on the use for unintended purposes" and Article 7 "Restrictions of the provision to outside parties" are to be complied more strictly than those stipulated in the Kakogawa-city Ordinance on the Protection of Personal Information.

[6] Source:
https://www.city.kakogawa.lg.jp/soshikikarasagasu/kyodo/shiminseikatsuanshinka/ICT/mimamori.html

[Article 5 Commentary on proper operation]
Paragraph 1 stipulates that Safety-care Cameras must be operated properly in compliance with the items specified in the Kakogawa-city Ordinance on the Protection of Personal Information.
However, Article 6 "Restrictions on the use for unintended purposes" and Article 7 "Restrictions on the provision to outside parties" are to be complied more strictly than those stipulated in the Kakogawa-city Ordinance on the Protection of Personal Information.
Paragraph 2 states that the items required for the operation of Safety-care Cameras shall be specified by the regulations.
The regulations also stipulate the appointment of a manager and a person in charge of operations, their responsibilities, and the process of how to store image data for how long, and other image handling processes.
[Article 6 Commentary on restrictions on the use for unintended purposes]
Among the image data captured by Safety-care Cameras, those images which are considered as personal information are restricted from the use for unintended purposes as specified in Article 3 and the provision to other administering agencies.
Personal information images are used only for the purposes of deterring crimes, early resolution of incidents, and ensuring the safety of citizens' lives.
"Other administering agencies" refer to Board of Education, Board of Elections, Equity Commission, Audit Committee Member, Board of Agriculture, Property Assessment Review Committee, Waterworks and Sewage Utility Manager, Fire Department, and Council.
[Article 7 Commentary on restrictions on the provision to outside parties]
Restrictions on the provision of image data to outside parties are specified.
Paragraph (1) states that image data shall not be provided to any entity other than the administering agencies of the city except as provided in Paragraph (1) Item (i) through Item (iii).

Figure 4.2-1 Kakogawa-city Ordinance on the installation and operation of Safety-care Cameras (Excerpts from article by article comments)[7](1/2)

[7] Citation: https://www.city.kakogawa.lg.jp/section/reiki_int/reiki_honbun/k312RG00000962.html

"When instructed in accordance with the laws and regulations or provisions thereof" in Item (i) refers to a case in which the provision to an entity other than the administering agencies is mandated by law, government ordinance, or ministerial ordinance.

Examples may include a court order to produce documents under Article 223 of the Code of Civil Procedure and a warrant issued by a judge under Article 218 of the Code of Criminal Procedure.

"Situation deemed as emergency and unavoidable for the protection of the life, body, or property of citizens" in Item (ii) refers to a situation in which the mayor determines it unavoidable to protect the life, body, or property of citizens due to an emergency such as a disaster, firefighting, or rescue operation, with no time to spare, weighing the balance between the stipulated protection and the potential infringement of the rights and interests of citizens by providing image data.

Example may include the cases of police search for a missing person or transmission of information regarding the damages caused in the event of a disaster.

"When received a request from an investigative agency for the purpose of a criminal investigation" in Item (iii) refers to a case of responding to a letter of inquiry under Article 197 Paragraph (2) of the Code of Criminal Procedure, and the like.

“Investigative Agency” refers to Coast Guard officer, narcotics officer, labor standard inspector, public prosecutor, etc. in addition to police officer.

For various issues in the region, such as graffiti and pet etiquette issues, the police and other investigative agencies will provide image data only when the issue is determined to be a crime and upon request.

Paragraph (2) states, when the provision of data to outside parties is made pursuant to the provision of the preceding paragraph, measures specifically set forth in the regulations shall be taken by the recipient of the image data provided, such as the restrictions on the purpose and method to use them or other necessary restrictions, or submission of the document pertaining to the necessary measures taken to prevent the leakage of the data or to properly manage personal information.

Figure 4.2-1 Kakogawa-city Ordinance on the installation and operation of Safety-care Cameras (Excerpts from article by article comments) (2/2)

(3) Creative approaches for the installation and operation of Safety-care Cameras

Hosting open meetings in preparation for the installation of Safety-care Cameras

As the Safety-care Cameras capture and record image data in real time, it is expected to be useful for the measures to prevent crimes in the region. On the other hand, it is extremely important to make considerations to the privacy of the people photographed. At the time, because some adverse opinions to the installation of Safety-care Cameras were expected, and also particularly careful approach was required for the installation and operation of Safety-care Cameras by the city, open meetings were scheduled at 12 venues in the city. It was intended that the mayor would personally explain regarding the installation of the Safety-care Cameras to the citizens to gain their understanding.

As a result, a total of 617 citizens participated in the open meetings. According to a questionnaire taken at the venue, 519 out of 523 respondents (99.2%) indicated that they were highly in favor that it was “necessary, or somewhat necessary”. In addition, according to a questionnaire taken via PR magazines and website, 850 out of 862 respondents (98.6%) responded favorably that it was “necessary, or somewhat necessary”.

Information disclosure on the city’s website (highly transparent approaches to initiatives)

[Locations of Safety-care Camera installations]

In addition to examinations based on the advice of criminology experts (examinations of camera locations based on the crime opportunity theory) and the incidence of criminal offenses (against children and women/others in the last three years) in the city, opinions of the region was taken into consideration to determine the installation locations. The installation locations are published on the city’s website (Kako Navi)[8] from the viewpoint of crime deterrence.

[8] https://www.sonicweb-asp.jp/kakogawa/map?theme=th_68#scale=7500

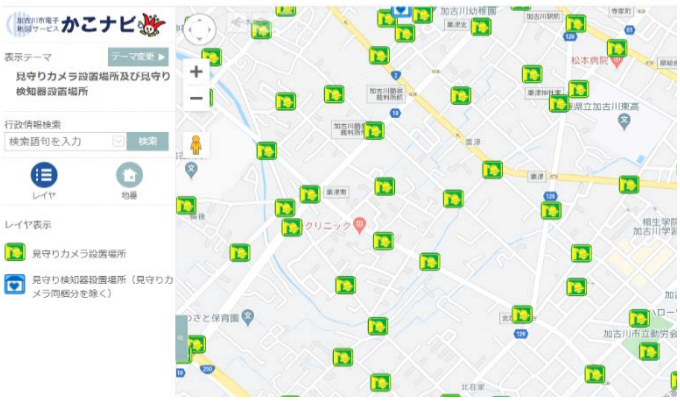

Figure 4.2-2 Displayed image of Kako Navi

[Status of the provision of images from Safety-care Cameras to outside parties]

In accordance with Kakogawa-city ordinance on the installation and operation of Safety-care Cameras (Article 9), the reasons for providing images of Safety-care Cameras to outside parties, the number of cases, and the names of the recipient outside parties are publicly disclosed[9]. By actively disclosing information on the operation status of Safety-care Cameras, highly transparent approaches are taken.

Table 4.2-5 Status of provision to outside parties in FY 2018

Reason for provision to outside parties	**Number of cases**	**Recipient**
Provision based on Article 7 Paragraph (1) Item (iii) of the Ordinance	644	Kakogawa Police Station
	9	Takasago Police Station
	3	Akashi Police Station
	2	Hyogo Pref. Police HQ
	2	Osaka Pref. Tenma Police Station
	1	Himeji Police Station
	1	Osaka Pref. Joto Police Station
Total	662	

9 https://www.city.kakogawa.lg.jp/soshikikarasagasu/kyodo/shiminseikatsuanshinka/ICT/mimamori.html

4.2.3 Rules for the handling of open data, etc.

Rules for the handling of open data, etc. include the following.

- Basic Act on the Advancement of Public and Private Sector Data Utilization
- Public and private sectors data utilization promotion plan, open data guidelines
- Rules for the use of open data (open data Terms of Use, recommended datasets, etc.)

(1) Basic Act on the Advancement of Public and Private Sector Data Utilization

Basic Act on the Advancement of Public and Private Sector Data Utilization stipulates the basic principles for the promotion of public and private sectors data utilization, the responsibilities of the Government, local governments, and business operators, the formulation of a basic plan for the promotion of public and private sectors data utilization, and other matters that form the basis of measures for the promotion of public and private sectors data utilization.

Article 1 (Objective) of the Act states that "it is important to further develop an environment conducive to the resolution of the issues confronting the country ... through the appropriate and effective utilization of large amount of diverse information distributed over the advanced information and communication network", and it places importance on the utilization of data for the resolution of issues.

(2) Public and private sectors data utilization promotion plan, open data utilization guidelines

Based on the Basic Act on the Advancement of Public and Private Sector Data Utilization, each prefecture is mandated to develop a plan for the promotion of public and private sectors data utilization, and each municipality is mandated to make efforts to develop it. This promotion plan is expected to formulate the basic policy on measures to promote the public and private sectors data utilization.

The open data utilization guidelines describe the basic concept, etc. for municipalities to disclose their data as open data and promote its utilization. The main subject matters include the significance of the promotion of open data, the definitions of open data, the basic concept of open public access, the basic rules for open data, and initiatives to promote utilization.

Table 4.2-6 Examples of open data utilization guidelines

Examples of rules (examples extracted from domestic use case research)
Yokohama-city Guidelines for the promotion of open data (Yokohama-city)
Guidelines for the promotion of the Shizuoka-style open data systems (Shizuoka-city)
Osaka-city Guidelines for open data initiatives (Osaka-city)

(3) Rules for the use of open data (open data Terms of Use, recommended data sets, etc.)

When publishing the data held by the municipality on the municipality's website, etc., rules for the use of public data are set for users. The main subject matters include intellectual property rights management, prohibited matters, exemption items, relationships with the Terms of Use of other websites, applicable laws and an agreed jurisdiction, etc.

In addition, the Government has published recommended data sets which summarize the data on tourist facilities, hospitals, etc. which municipalities should make available as open data, and the rules and formats to be adopted when creating open data. They describe data item names, item definitions, and data notation methods, and have adopted the data model based on the common vocabulary base, the set of Digital Government Promotion Standard Guidelines, and the Administrative Data Collaboration Standards which are mechanisms for administrative interoperability.

Table 4.2-7 Examples of rules for the use of open data

Examples of rules (examples extracted from domestic use case research)
Yokohama-city Open Data Portal Site, Terms of Use (Yokohama-city)
Takahashi River Valley Open Data Portal Site, Terms of Use (Kurashiki-city and surrounding municipalities)

4.3 Deregulation & utilization of Special Zones system, revision of the laws

If the service to be implemented cannot be implemented due to non-compliance with the relevant laws and regulations, it may become possible to implement it by requesting deregulation such as utilizing the Special Zones system. In addition, reflecting social necessity and technological advancement, the Government is conducting or reviewing revisions of the laws. These are described below.

4.3.1 Deregulation & utilization of Special Zones system

(1) Deregulation by way of Special Zones system

In order to accommodate the regulatory reform needs of each region, the Government has implemented a system of three Special Zones, namely, Special Zones for Structural Reform, Comprehensive Special Zones, and National Strategic Special Zones[10].

Special Zones for Structural Reform, established in 2002, are a system to enable nationwide utilization of the regulatory reform items once certified locally. Comprehensive Special Zones, established in 2011, are a system to provide comprehensive support including financial support as well as preferential regulatory measures for comprehensive initiatives on specific themes in the region. National Strategic Special Zones, established in 2013, are a system aimed at making a breakthrough in the reform of bedrock regulations to advance the growth strategy of the country by limiting the regions where utilization is permitted. Table 4.3-1 shows some examples of certification plan for Comprehensive Special Zones.

[10] Source: https://www.kantei.go.jp/jp/singi/tiiki/kokusentoc/kokkasenryakutoc.html

Table 4.3-1 Certification plan for Comprehensive Special Zones

Name of Comprehensive Special Zones	**Year established**	**Applicable municipality**
Kashiwanoha Campus Special Zones for "Autonomous urban management through public, academic, and private sectors collaboration"	2012	Kashiwa-city
Next generation energy & mobility creation Special Zones	2012	Toyota-city
Smart Wellness City Comprehensive Special Zones to create healthy & longevity society	2012	Mitsuke-city, Date-city, Niigata-city, Sanjo-city, Gifu-city, Takaishi-city, Toyooka-city, Urayasu-city, Otahara-city, Okayama-city, Tsukuba University, Tsukuba Wellness Research Co., Ltd.
Next generation automobile & smart energy Special Zones	2012	Saitama-city

As for National Strategic Special Zones, as of December 2019, 10 districts across the country have been certified and more than 300 certified projects are under way. In the field of near-future technologies, the projects shown in Table 4.3 2 have been certified.

Table 4.3-2 Certified projects in the field of near-future technologies

Regulatory reform item	**Overview**	**Implementation timing, etc.**	**Applicable municipality**
Specified Experimental Test Station	Significant shortening of the procedures for issuing radio licenses	Released in January 2016	Tokyo Metropolis, Kyoto Pref., Fukuoka-city, Kita-kyushu-city, Senboku-city, Aichi Pref., Hiroshima Pref.
One-stop center for near-future technologies verifications	Establishing a one-stop center for near-future technologies verifications to promote experiments of autonomous driving of automobiles and small unmanned vehicles	Special Zones Act in June 2017	Tokyo Metropolis, Kanagawa Pref., Chiba-city, Fukuoka-city, Kita-kyushu-city, Okinawa Pref., Sendai-city, Aichi Pref.

4.3.2 Trends in the revision of the laws

Table 4.3-3 shows some examples of trends in the revision of the laws. As the Government is in the process of revising or reviewing the laws in various fields, it is important to be aware of the trends in the revision of the laws when examining smart city initiatives.

Table 4.3-3 Trends in the revision of the laws

Field	**Applicable Laws and Regulations**	**Review status, etc. of revision of the laws**
Autonomous driving	Road Traffic Act, Road Trucking Vehicle Act	Amendments for the practical use of Level 3 (conditional autonomous driving) Established in May 2019, enforced in April 2020
MaaS	Act on Revitalization and Rehabilitation of Local Public Transportation System	Amendments are under review for the spread of Maas (one-stop procedures for multiple transportation operators to set fares, system for establishing legally mandated council of operators and municipalities, etc.) Cabinet approval of the amendment proposal in February 2020
Utilization of individual records from Smart Electricity Meter	Electricity Business Act	Under review by Ministry of Economy, Trade and Industry, Advisory Committee for Natural Resources and Energy, Strategic Policy Committee, and Subcommittee on Construction of Sustainable Electricity System