Guidelines for Setting KPIs for Smart City Initiatives (Second edition)

April, 2023

This edition is an updated version of the KPI setting guidelines for the smart city initiatives released in April 2022.

A video explaining these guidelines and collection of case studies using the guidelines are also available, so please refer to them when using the guidelines.

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I Introduction

1. Purpose of This Document

While smart city initiatives are progressing in areas across the country, evaluation frameworks have not yet been fully developed in many areas, and it is necessary to evaluate the initiatives and improve them accordingly. The purpose of this document is to promote the PDCA cycle and spread the use of evidence-based policy making (EBPM) in relation to the smart city initiatives, by providing a framework and evaluation indicators for the appropriate evaluation of the various smart city initiatives being promoted by the regions (consortiums, etc.). Through this, the document aims to promote the appropriate evaluation of the initiatives in each region and the improvement of the initiatives based on the evaluation.

2. Features of This Document

This document contains the following three features:

(1) This document uses a logic model to show how to make it easier to evaluate initiatives in a logical way.

- - - The document explains how to create a logic model and the key points. If you can create a logic model properly, it will be easier to find points that need to be improved in order to achieve the final goal of the initiatives. A logic model is one way of “visualizing”, which is effective when formulating or reviewing initiatives.

(2) This document explains how to set evaluation indicators and KPIs that are suitable for evaluating initiatives.

- - - KPIs are to be set at each stage of a logic model to check whether appropriate outcomes are being achieved. This document explains how to set KPIs and the key points. If KPIs are set properly, the objectivity of initiative evaluation will increase. It also enables evidence-based policy making (EBPM).

(3) This document guides you to balance the commonality of indicators and the uniqueness of the region by introducing a quasi-selection system for evaluation indicators and KPIs.

- - - The document suggests an evaluation axis and guides you to set evaluation indicators in three levels, “recommended”, “selection” and “optional”, while respecting the diverse situations of cities.

◆ 3 evaluation indicators

Recommended indicator: An evaluation indicator that all regions should adopt

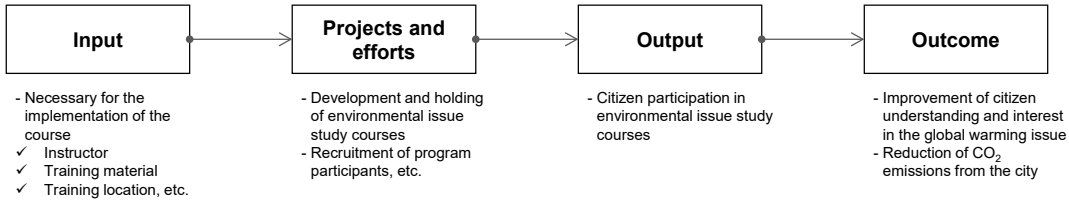
Selection indicator: An evaluation indicator that the region selects from among the candidate indicators presented to reduce the effort required for regional KPI settings

Optional indicator: An evaluation indicator that regions freely devise and set in order to flexibly match the uniqueness of cities

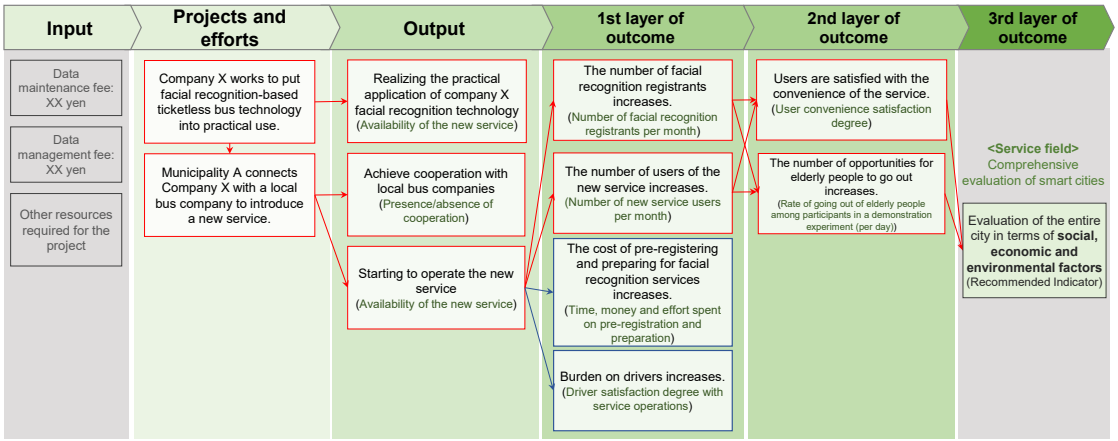
3. What Is a Logic Model?

A logic model is a systematic diagram that shows a path to achieving “change and outcome” that a business or organization ultimately aims for. It has the following advantages when formulating initiatives: 1) being able to conceptualize initiatives and identify design flaws and problems; 2) being able to prepare for program evaluation, such as impact evaluation; and 3) being able to logically plan initiatives (logically proceed from the “C to A” of PDCA).[1, 2]

[**Four components of a logic model** (Using an example of a course on environmental issues)]

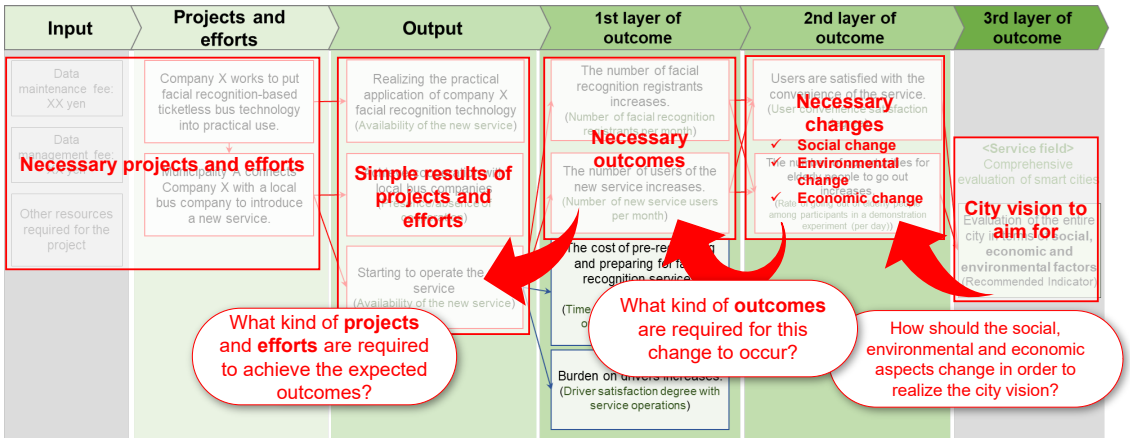


The chart below shows the completed logic model that is to be achieved with this document, based on the description above. (The example is an initiative to “improve the convenience of public transportation and encourage older people to go out more by putting facial recognition technologies to practical use”.)



[1] Nippon Foundation “Logic Model Creation Guide”, MEXT website
[2] Toru Sato, “An Introduction to Evidence-Based Municipal Policies: How To Create and Utilize Logic Models”, Koshokuken, 2021

Furthermore, sometimes it is easier to understand a logic model if you think about it by working backwards from the goal. Therefore, if you are having trouble thinking about it, try looking at it from a bird's eye view starting from the third layer of outcomes.



4. How To Use This Document

In Chapters II onward, the specific methods for creating a logic model and setting KPIs will be explained, and the following points should be kept in mind.

(1) Please use the order of the steps as a guide, and deepen your understanding by going back and forth.

- - - The general flow of creating a logic model and setting KPIs is explained in the steps, but there are also likely to be many things you notice as you proceed with your consideration. In that case, there is no problem with re-considering it retrospectively. Please go back and forth through the steps to deepen your understanding.

(2) Please unify your methodologies.

- - - While the content, abstraction level, and creation method of a logic model may differ depending on the purpose and how it is used, the aim is to create an evaluation system that is consistent throughout, so your cooperation in unifying to the methodology in this document is appreciated.

(3) Working (discussions) with multiple members is recommended.

- - - This not only helps to spread out the workload, but also has the benefit of preventing bias in perspective and knowledge and allowing multiple members to reconfirm and share the original purpose and goals of initiatives.

1. Extracting the Initiatives to be Evaluated

What to evaluate is “smart city-related initiatives[3]”. For evaluation, please select measures that meet the following two requirements:

(1) The purpose of the initiative must be clearly linked to the realization of sustainable cities and regions or the realization of Society 5.0.

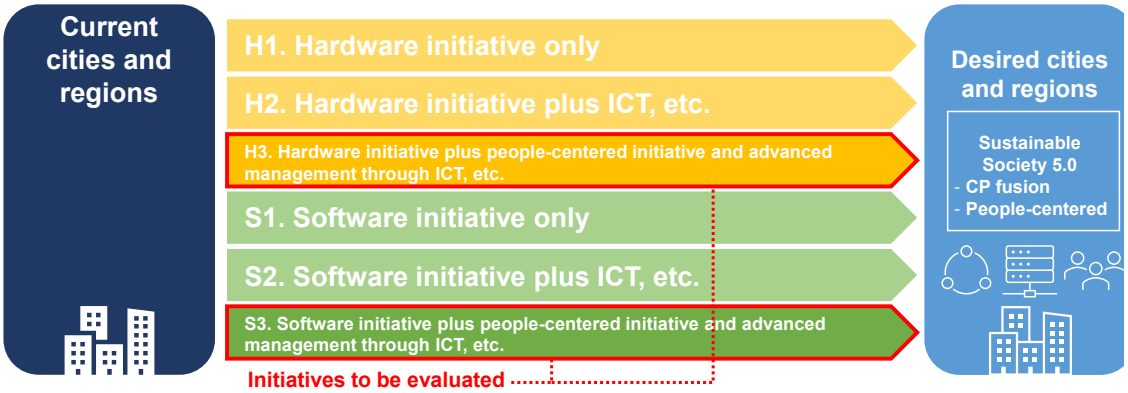
(2) Initiative that leads to A, B, and C by utilizing new technologies such as ICT and various data from public and private sectors

-A. Initiative to provide services that are tailored to the needs of individual citizens

-B. Initiative to improve the management (planning, development, management, operation, etc.) of cities and regions

-C. Initiative that forms the infrastructure

The following levels of initiatives are considered desirable in terms of concept. Please note that initiatives at the basic research stage and initiatives that are not specific to cities or regions are not subject to evaluation.



For example, the following are examples of H1 to H3:

H1. Developing the station square

H2. Developing the station square, installing digital signage, and broadcasting information for the general public

H3. Developing the station square, installing digital signage, using AI cameras, etc. to provide information to individuals viewing the signage, or installing people flow sensors and using obtained data for the management and operation of the square

Although this level of initiative is intended as a concept, it is possible to use this document to visualize a logic model and set KPIs for smart city initiatives, not limited to this level of initiative.

[3] Cabinet Office “Smart City Guidebook, 1st Edition, Ver. 1.00”

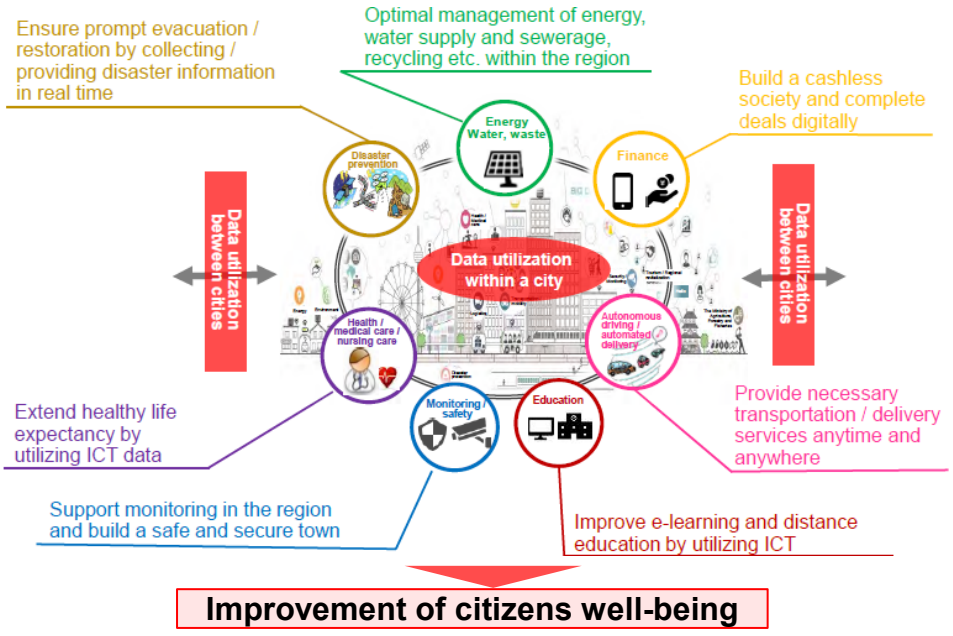
◆ **3 basic philosophies of a smart city**

Citizen (user) centered approach; focus on vision and issues; emphasis on inter-field and inter-city cooperation

◆ **5 basic principles**

Ensuring fairness and inclusiveness; ensuring privacy; ensuring interoperability, openness and transparency; ensuring security and resilience; ensuring sustainability in terms of operation and funding.

◆ **Image of target initiatives**

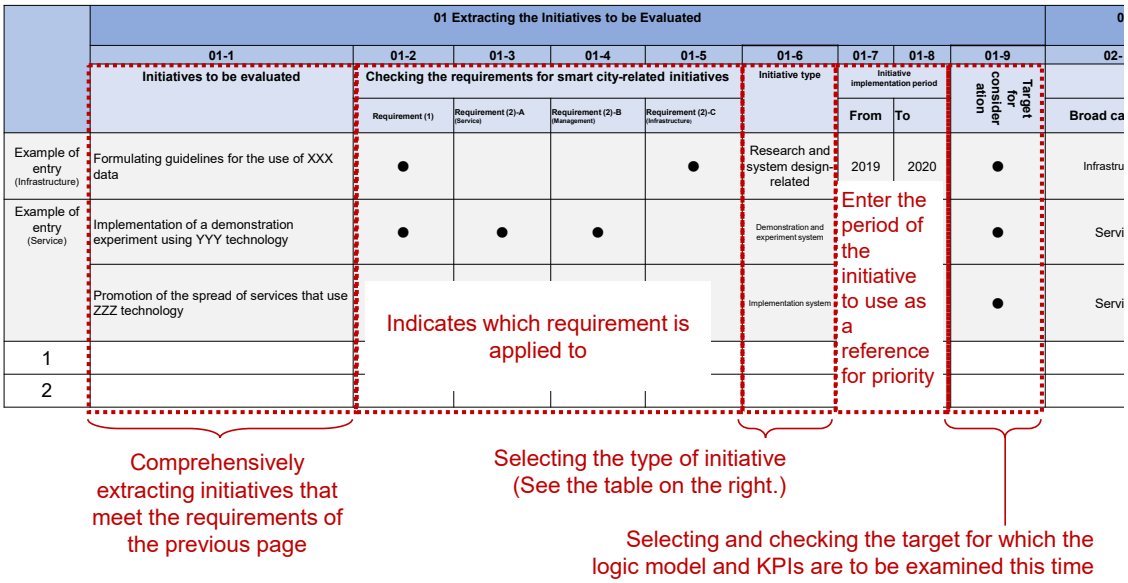


Next, the types and examples of smart city initiatives will be introduced.

Initiative type	Initiative example
Plan-related	Formulation of an overall plan; project management; checking the overall situation; consideration of evaluation methods
Research and system design-related	Consideration of systems, rules and guidelines; consideration of new systems and services; consideration of measures for dissemination and deployment; data standardization
Demonstration and experiment-related	Prototype development and verification; system and technology verification; feasibility studies; social demonstration; demonstration research and verification; model business and model case formulation
Implementation-related	System construction, maintenance, and improvement; database construction; restructuring of data structures; practical application based on demonstration experiments; support for migration to new systems

	Promoting the use and spread of new services; making systems and services more widely known; increasing the number of registrations

Since it is difficult to consider all initiatives from the beginning, you may consider the most important ones first. A worksheet (Excel) is available to help you identify the initiatives that are more important and should be evaluated. How to use the worksheet is as follows:



2. Confirming the Initiative Fields

Confirm the initiative fields to be evaluated. For “Requirement (2) of the initiatives to be evaluated in the previous section, two broad categories have been established, and detailed evaluation fields have been established under these categories. Please refer to the table below to confirm the “broad categories” and “evaluation fields”. When using the worksheet, the broad category is “service” if there is a mark in columns 01-3 and 01-4, and “infrastructure” if there is a mark in column 01-5 column.

Requirement (2)	Broad category	Evaluation field	Initiative theme example
(2)-A Initiative to provide services that are tailored to the needs of individual citizens	Service	Mobility	Transportation/mobility, logistics, transportation hub
		Environment/ Energy	Environment, energy, water resources, waste
		Disaster Prevention/ Crime Prevention	Disaster prevention, crime prevention
		Infrastructure/ Facilities	Infrastructure maintenance and management, urban planning and development, facility management, housing, construction, real estate
(2)-B Initiative to improve the management (planning, development, management, operation, etc.) of cities and regions		Health/ Medical Care	Health, medical care, nursing care
		Industry/ Economy	Agriculture, forestry and fisheries; tourism and regional revitalization; industry creation and industry-academia cooperation; digital currency and payment; work styles
		Local Community	Local community building, local autonomy, social activities
		Education/ Culture	Education, child-rearing, culture and art
		Government Administration	e-service, digital management
(2)-C Initiative that forms the infrastructure	Infrastructure	IT Infrastructure	Data, data linkage (beyond the framework of fundamental municipalities), City OS, asset/network, accessibility
		Management Organization Framework	Promotion of cooperation between government and citizens, promotion of citizen participation, establishment of a data governance system, operating fund
		Human Resources	Human resources for leadership/management and IT/security

Examples of initiatives for each theme are as follows. Please refer to them.

Broad category	Evaluation field	Initiative theme example	Specific Example of an Initiative Theme
Service	Mobility	Transportation/ Mobility	- MaaS application/service - On-demand transportation - Automated driving - Green slow mobility - Mobility support robot - Sharing - Mixed loading of passengers and cargo - Last one mile - Analysis, prediction, and service creation using data
		Logistics	- Delivery of goods by AI, drones, robots, self-driving cars, and demand-based private paid passenger transport - Last one-mile delivery of goods
		Transportation Hub	- Selecting a means of transportation using AI at terminal - App-based vehicle dispatching
	Environment/ Energy	Environment	- Ecosystem
		Energy	- AEM - Smart energy - Hydrogen energy - Securing energy in the event of disaster - Local production for local energy consumption
		Water Resources	- Rainwater utilization
		Waste	- Biomass power generation - Reuse of recyclable waste
	Disaster Prevention / Crime Prevention	Disaster Prevention	- Disaster prevention database - Standard API for disaster information - Promoting disaster prevention through the use of IoT
		Crime Prevention	- Automatic reporting through AI analysis of security cameras - Drone-based patrol service
	Infrastructure/ Facilities	Infrastructure Maintenance and Management	- Inspection of bridges using ball-shell drones
		Urban Planning and Development	- Drone control system high-precision 3D map
		Facility Management	- Congestion detection solution - People flow analysis using cameras - Centralization and provision of parking lot availability information
		Housing	- Smart house - HEMS
		Construction	- Introduction of industrial robots

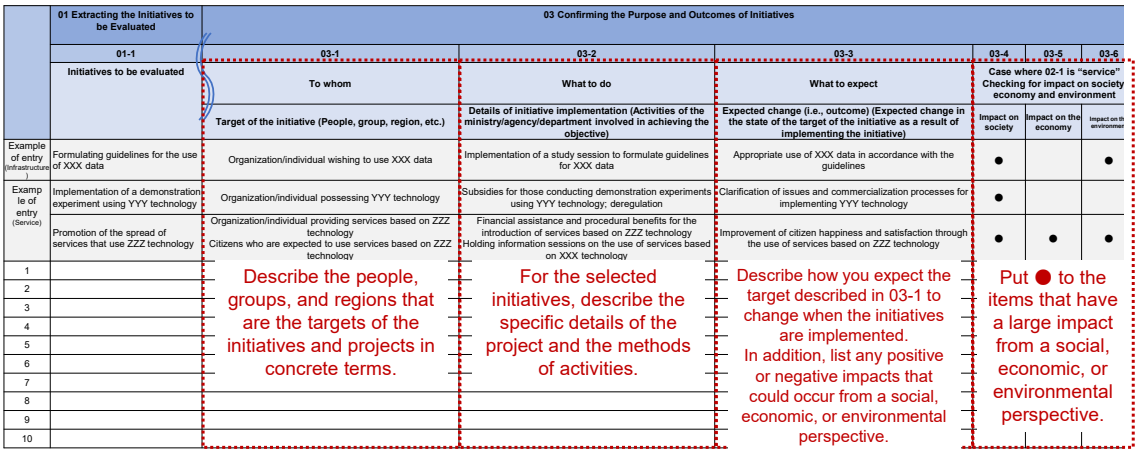
Broad category	Evaluation field	Initiative theme example	Specific Example of an Initiative Theme
		Real Estate	- Housing price simulation - Real estate ID
	Health/ Medical Care	Health	- Health point - Utilization of health data
		Medical Care	- Construction of a medical database - Remote medical care/ remote medical examination - Online vehicle dispatch service for hospital visits - Health checkup information (PHR) application
		Nursing Care	- Nursing care robot
	Industry/ Economy	Agriculture, Forestry, and Fisheries	- Smart agriculture, fisheries, and forestry
		Tourism and Regional Revitalization	- Information provision - Cooperation with transportation sectors (MaaS, transportation infrastructure, green slow mobility, etc.) - Data utilization - Content creation - Inbound
		Industry creation and industry-academia cooperation	- Introducing robots, drones, and AI into local industries - Fostering advanced industries - Formation of local industry revitalization bases - Data provision and utilization - Creation of local industries that will serve as platforms for ICT demonstration research
		Digital Currency and Payment	- Payment - Local currency - Cashless payment - Biometric and NFC authentication - Local currency and point system
		Work Style	- Work style reform - Telework - Co-working - Working and traveling environment in a suburban living area - Making commuting time more fulfilling - Automation of labor work
	Local Community	Local Community Formation	- VR community - Establishment of a smart city consortium
		Local Self-Government	- Delivery of ward newsletters by app
		Social Activities	- Automatic cleaning robot

Broad category	Evaluation field	Initiative theme example	Specific Example of an Initiative Theme
	Education/ Culture	Education	- On-demand learning courses - Digital library
		Child-rearing	- Online maternal and child health handbook - Chat tool with local center
		Culture and Art	- VR art exhibition opening
	Government Administration	e-service	- Online administrative procedures
		Digital Management	- Introduction of chatbots
Infrastructure	IT Infrastructure	Data	- Promotion of open data - Promotion of open data by design - Turning statistical data into open data - Promotion of KDB - Linking open data with Individual Number Card information - Registering data in an open data catalog
		Data cooperation (beyond the framework of fundamental municipalities)	- Sales activities and data needs research to promote public-private data linkage
		City OS	- Construction of an City OS - API cooperation for services
		Assets/ Networks	- Network development in disadvantaged regions - Establishing an appropriate IT infrastructure management system - Appropriate maintenance and management of IT infrastructure
		Accessibility	- Establishment of a system for self-evaluating the accessibility of services - Eliminating the digital divide in communication and broadcasting services
	Management Organization Framework	Promotion of public-private-academia cooperation	- Call for new public-private-academia cooperation - Management and enhancement of a public-private-academia cooperation framework
		Promotion of Resident Participation	- Promotion of opportunities for resident participation - Support for resident participation organizations - Utilization of online citizen dialogue tools (e.g., Decidim)
		Operating Fund	- Budgetary provision for digital services

Broad category	Evaluation field	Initiative theme example	Specific Example of an Initiative Theme
		Establishment of Data Governance System	- Establishment of a data governance system
	Human Resources	Human Resources for Leadership and Management	- Promoting participation in the smart city leadership and management human resource development program - Training and dispatching local human resources to promote data utilization
		Human Resources for IT and Security	- Resident participation literacy improvement events - Digital utilization support personnel - Cyber security help team

3. Initiative Details Confirmation

Check the initiative targets, activity content, and expected outcomes. If you organize these before creating a logic model, the creation process will go smoothly. If using the worksheet, please refer to the figure below and sort out the initiative targets, activity content, and expected outcomes while filling in 03-1 to 6.



4. Differences in Outcome Between Service and Infrastructure Fields

The main focus of the service field is “the provision of services that are tailored to individual citizens and the advancement of management (planning, development, management and operation, etc.) of cities and regions”, while the main focus of the infrastructure field is “the formation of the infrastructure for providing services”. The difference in the main focus of these fields results in differences in outcome on the logic model.

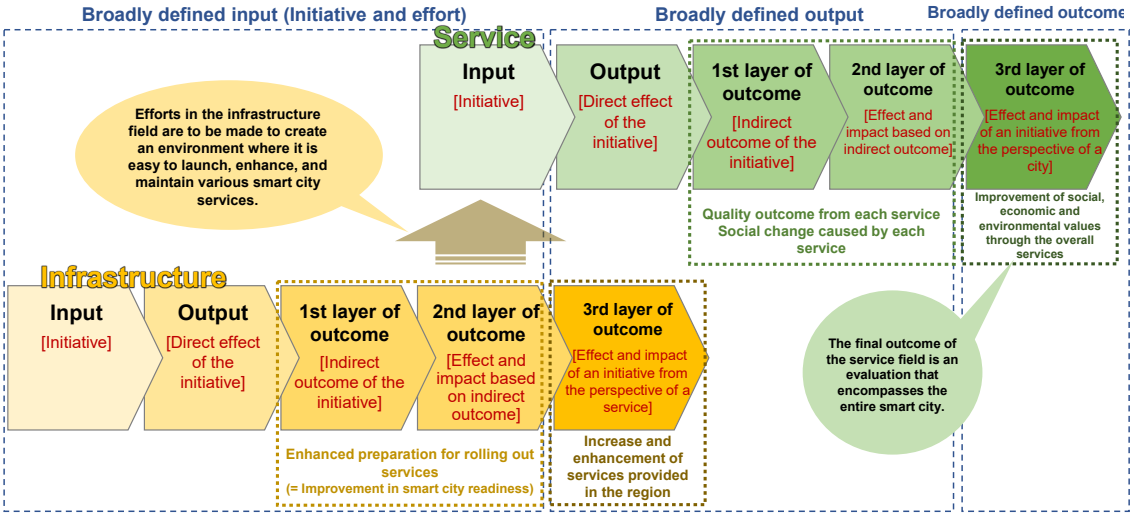
Therefore, when considering a logic model, please set outcomes according to the broad categories of the initiatives.

◆ Main focus and expected outcomes in each field

Broad category	Main Focus	Expected Outcome
Service	Provision of services that are tailored to individual citizens and the advancement of management (planning, development, management and operation, etc.) of cities and regions	● Quality outcome from each service ● Social changes caused by each service ● Improvement of social, economic and environmental values through the overall services provided in the region
Infrastructure	Formation of infrastructure for providing services	● Being ready to provide services ● Increase and enhancement of services

Next, the overall picture of a logic model is described. A logic model is to be set for each initiative, but when considering initiatives for the entire region, the infrastructure field supports the provision of services, and the final outcome of the service field results in the outcome of the entire smart city.

◆ Overall picture of logic model

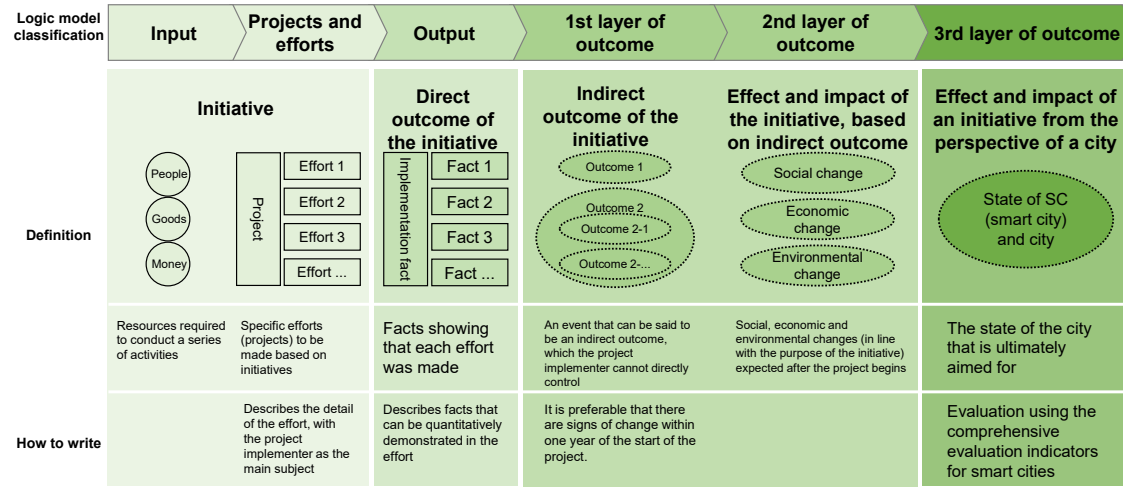


The concept of Smart City Readiness (SCR), which is a group of indicators that make up the first and second layers of outcomes in the infrastructure field, is defined as a group of indicators that show the extent to which an environment is well-prepared for the launch, enhancement, and maintenance of various smart city services, and the recommended indicators in the infrastructure field fall into this category.

5. Logic Model and Evaluation Approach for the Service Field

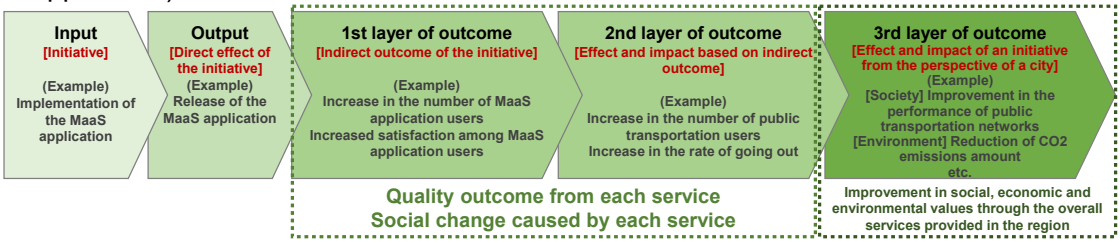
The classification and definitions of logic models in the service field are as follows. Please note that the names and expressions of the layers in the guidelines may differ depending on the business that is subject to indicator setting.

◆ **Classification and definitions of logic models in the service field**



Following this definition, if we consider the outcomes of the logic model using the example of “implementing a MaaS app” based on the basic form of the logic model, the flow would be as follows:

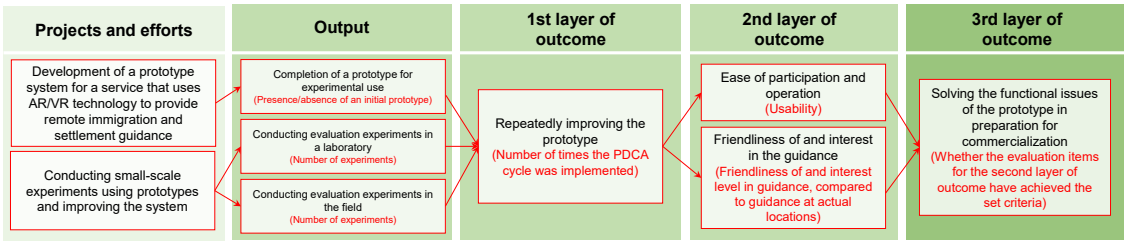
◆ **Basic form of logic model for the service field** (e.g., implementation of a MaaS application)



In some cases, a logic model may not be the basic form for initiatives (such as demonstration experiments) in the service field before implementation. In terms of the implementation business, the goal to be achieved after the outcome is the social impact after the service has taken hold. However, the goal to be achieved for pre-implementation initiatives (such as demonstration experiments) is led to the decision on whether to proceed to the social implementation phase and the preparation for implementation.

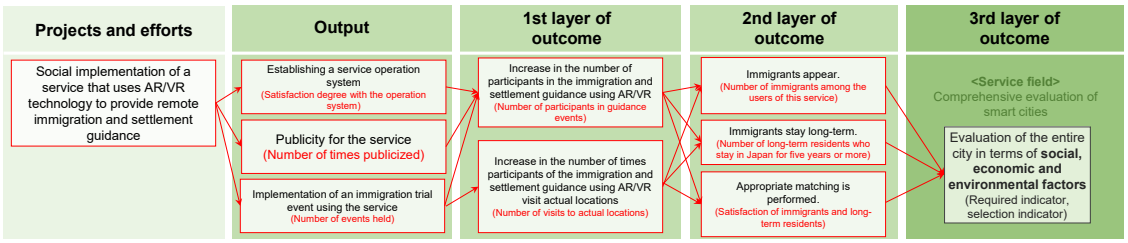
For example, when taking an “immigration and settlement consultation business using AR/VR” as an example, the logic model for pre-implementation initiatives (such as demonstration experiments) is as follows.

◆ **Example of a logic model for a <u>pre-implementation business</u> for an immigration and settlement consultation business that utilizes AR/VR**



When it comes to an implementation business, the logic model is thought to change as follows:

◆ **Example of logic model for an <u>implementation business</u> for an immigration and settlement consultation business that utilizes AR/VR**



The following are some specific examples of initiatives of pre-implementation businesses:

◆ **Types and specific examples of initiatives of pre-implementation businesses**

Type	Specific Example
Plan-related	Formulation of an overall plan; project management; checking the overall situation; consideration of evaluation methods
Research and system design-related	Consideration of systems, rules and guidelines; consideration of new systems and services; consideration of measures for dissemination and deployment; data standardization
Demonstration and experiment-related	Prototype development and verification; system and technology verification; feasibility studies; social demonstration; demonstration research and verification; model business and model case formulation

6. Logic Model and Evaluation Approach for the Infrastructure Field

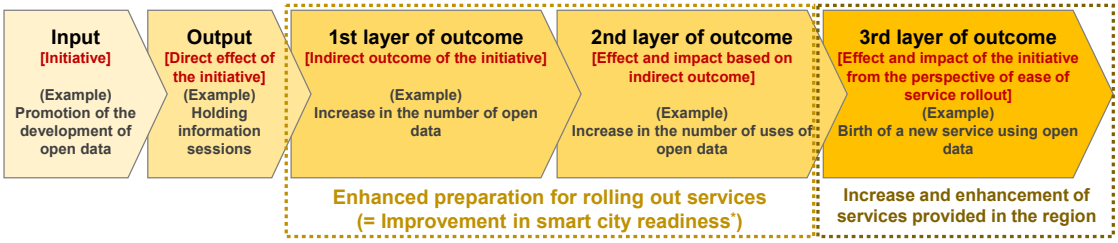
The classification and definitions of logic models in the infrastructure field are as follows. Please note that the names and expressions of the layers in the guidelines may differ depending on the business that is subject to indicator setting. As aforementioned, Smart City Readiness (SCR) refers to a group of indicators that show the extent to which an environment is well-prepared for the launch, enhancement, and maintenance of various services.

◆ Classification and definitions of logic models in the infrastructure field

Logic model classification	Input	Projects and efforts	Output	1st layer of outcome	2nd layer of outcome	3rd layer of outcome
Definition	Initiative * Basically, the initiatives in the infrastructure field are related to SCR. People / Goods / Money	Project: Effort 1 / Effort 2 / Effort 3 / Effort ...	Direct outcome of the initiative Implementation fact: Fact 1 / Fact 2 / Fact 3 / Fact ...	Indirect outcome of the initiative SCR1 SCR2 Outcome 2-1 Outcome 2-...	Effect and impact of the initiative, based on indirect outcome Effect and impact of SCR1 Effect and impact of SCR2	Effect and impact of the initiative from the perspective of ease of service rollout Smart city infrastructure utilization status (Achieving the launch, enhancement, and maintenance of various services)
	Resources required to conduct a series of activities	Specific efforts (projects) to be made based on initiatives	Facts showing that each effort was made	An event that can be said to be an indirect outcome, which the project implementer cannot directly control	Effect and impact expected after the project begins (This will be an outcome that demonstrates the effectiveness of SCR.)	Status of preparation and utilization of the smart city infrastructure
How to write		Describes the detail of the effort, with the project implementer as the main subject	Describes facts that can be quantitatively demonstrated in the effort	It is preferable that there are signs of change within one year of the start of the project.	Describing the expected effect of having SCR in place (Also describing any negative impacts that may occur to a possible extent)	Describing the evaluation of the preparation system and quality of the infrastructure in each region, based on aspects such as the amount of services provided using the infrastructure

Following this definition, if we consider the outcomes of the logic model using the example of “promoting the development of open data” based on the basic form of the logic model, the flow would be as follows:

◆ Basic form of logic model for the service field (e.g., promoting the development of open data)

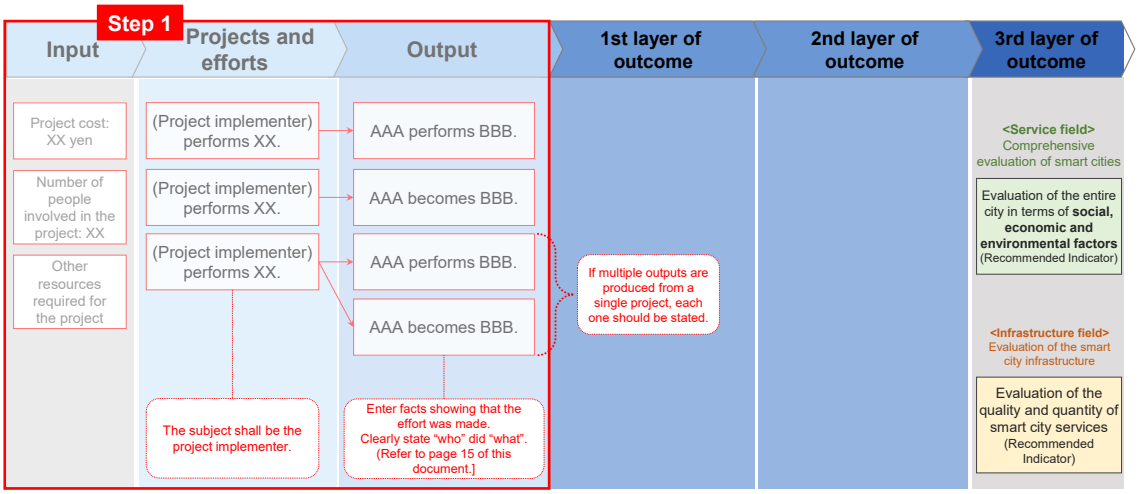


7. How To Create a Logic Model

The creation of a logic model is to be performed in five steps, from Step 1 to Step 5. This is the basic procedure, and you can go back and forth through the steps as required. If you are creating a logic model in a single flow from the infrastructure field to the service field, it is likely that you will be going back and forth between their respective logic models, so this procedure is not applied in this way.

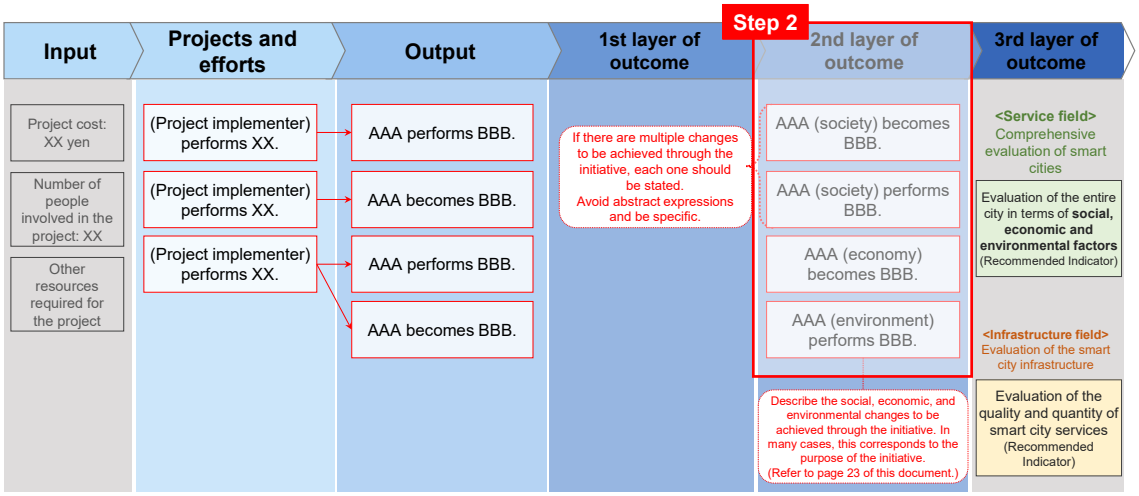
[Step 1]

First, to create a logic model, enter information for input, business/efforts, and output for each initiative. If you are using the worksheet, enter information for input, business/efforts, and output in accordance with the information you entered in 03-1 to 2.



[Step 2]

Next, based on the purpose of the initiative, enter information for the second layer of outcome. If you are using the worksheet, enter information for the second layer of outcome in accordance with the information you entered in 03-3.



When considering the second layer of outcome in the service area, it is easier to enter if you think about which areas of society, economy, and environment will be impacted, with reference to the "expected outcome"[4] listed in the Smart City Guidebook.

◆ **Expected outcomes of smart city initiatives and expression of the second layer of outcome**

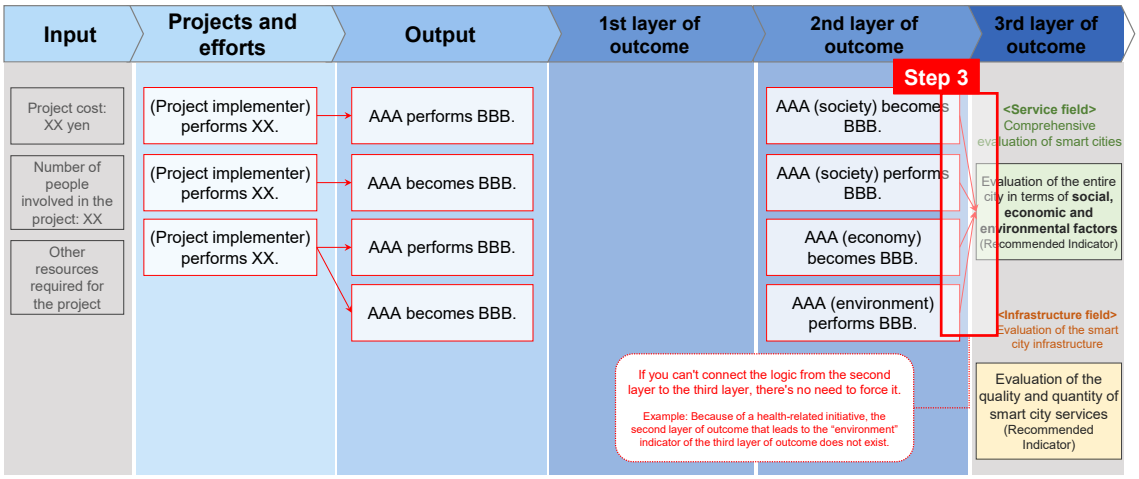
Field	Expected Outcome	Expression of the Second Layer of Outcome
Society	(1) By making all city services — such as administrative procedures, purchasing, transportation, medical care, health, and tourism — more efficient and more responsive to individual attributes and preferences, it will be possible to achieve social inclusion, in which all citizens can equally enjoy convenient and prosperous lives. (2) In the event of disaster or the spread of infectious disease, immediate responses based on data can be taken, and new remote and real places for living and working in the new normal can be provided, so that people can enjoy safe and secure lives.	Expressing the outcomes of initiatives focusing on people and communities
Economy	(1) An environment is created in which various citizen and business operator-oriented services that make full use of various data and new technologies are created one after another, and local economies are revitalized.	Expressing the outcomes of initiatives focusing on government and local industry

[4] Cabinet Office, Smart City Guidebook, 1st Edition, "Outcomes of a Smart City"

	(2) Citizens and visitors move about in a safe, convenient and comfortable city, and the local economy is stimulated by consumption and the purchase of services, while various innovations are born through interaction. (3) The efficiency of systems in companies and government is improved, leading to increased productivity.	
Environment	In all situations, including work activities, daily life and travel, energy and resource use is optimized in response to the movement of real people and goods, leading to the realization of a decarbonized society.	Expressing the outcomes of initiatives focusing on cities and regions

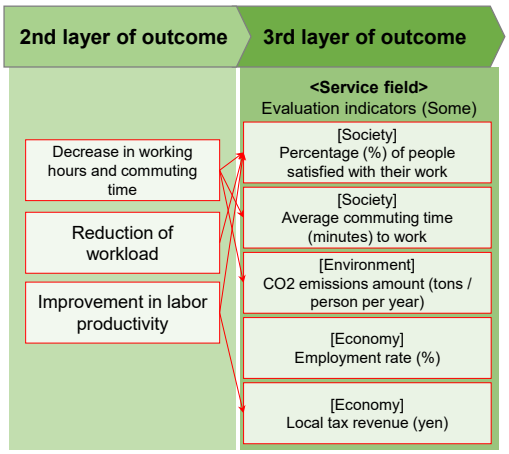
[Step 3]

For the third layer of outcome, candidates for evaluation indicators have been set in advance for both the service and infrastructure fields. Refer to the description for each initiative in Chapter III, set the third layer of outcome, and draw arrows so that each evaluation indicator is logically connected. If you are using the worksheet, enter information in accordance with the information you entered in 03-4 to 6.

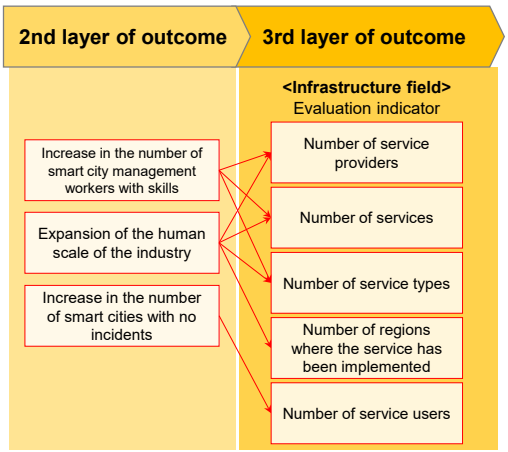


For example, when taking telework promotion initiatives in the service field and smart city education program implementation support initiatives in the infrastructure field, the following logic models can be considered:

◆ **Example: Telework promotion initiative**

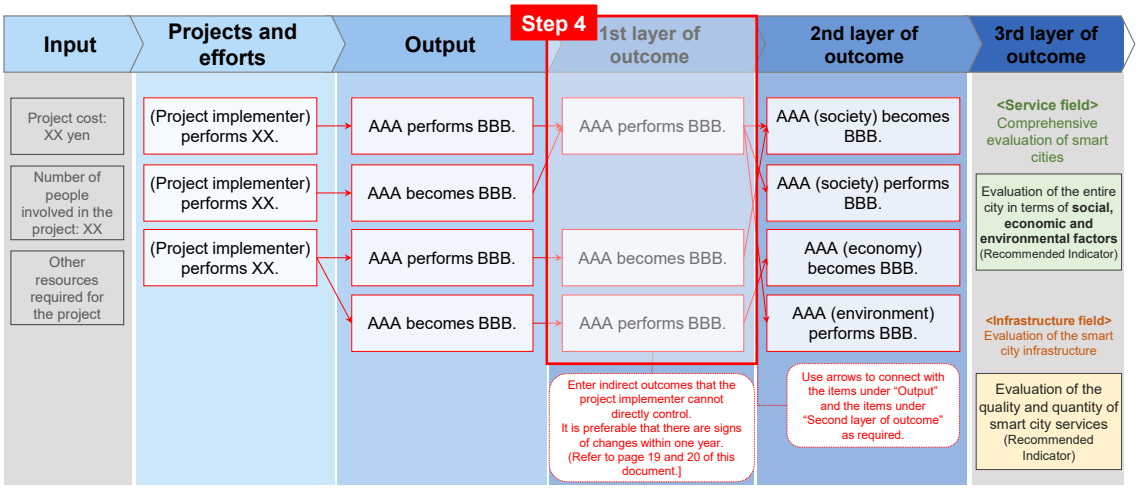


◆ **Example: Smart city education program implementation support initiative**



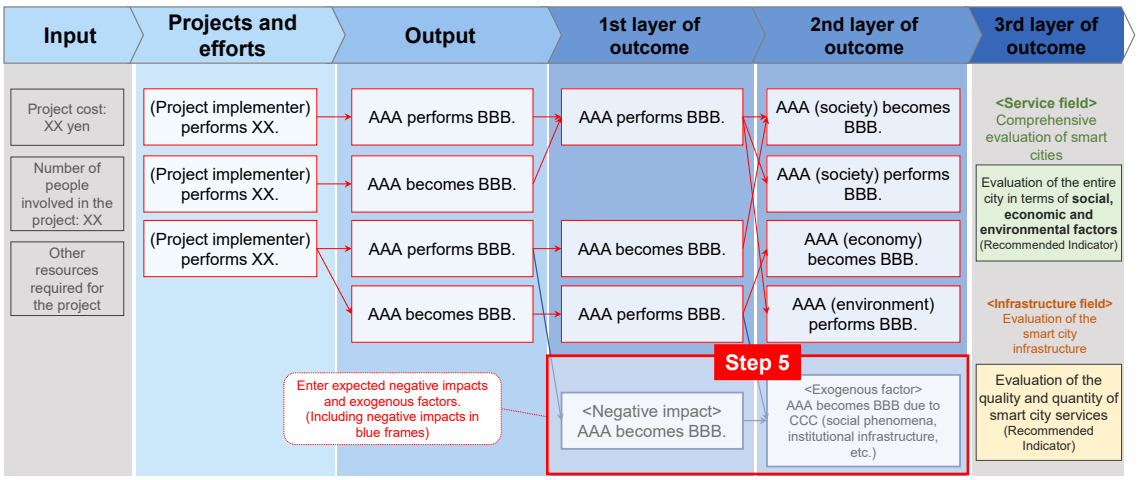
[Step 4]

Enter information for the first layer of outcome, considering the connection between the second layer of outcome and output. For the first layer of outcome, enter indirect (not directly controlled by business operators) outcomes brought about by the initiative itself.



[Step 5]

Finally, if there are any negative impacts or exogenous factors that could be a trade-off due to the implementation of the initiative, enter them here. If outcomes may change significantly due to other factors not included in the logic model, these factors should also be monitored.



For example, while the spread of automated driving is leading to a reduction in traffic congestion, it will also lead to an increase in total traffic volume and an increase in CO2 emissions. While the value of society and economy is improved, the value of the environment is deteriorated, creating a trade-off relationship. It is necessary to monitor such trade-offs.

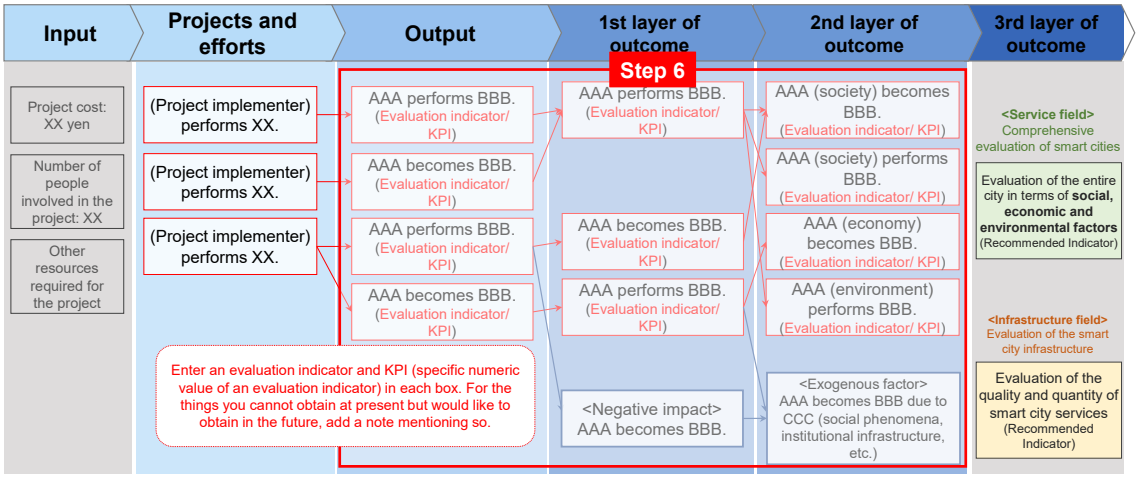
The logic model is now complete. In the next chapter (Chapter III), the method for setting KPIs is described.

1. Approach to Setting KPIs

This section explains the approach to setting KPIs, and the next section explains the KPI indicators for each stage in each field.

For each output and outcome in the logic model, set an evaluation indicator (the specific numeric value = KPI). For the things you cannot obtain at present but would like to obtain in the future, it is effective to add a note mentioning so.

Consider what indicators would be effective for checking whether each output and outcome has been achieved, and set them accordingly. For each output and outcome, you can set one or more KPIs.



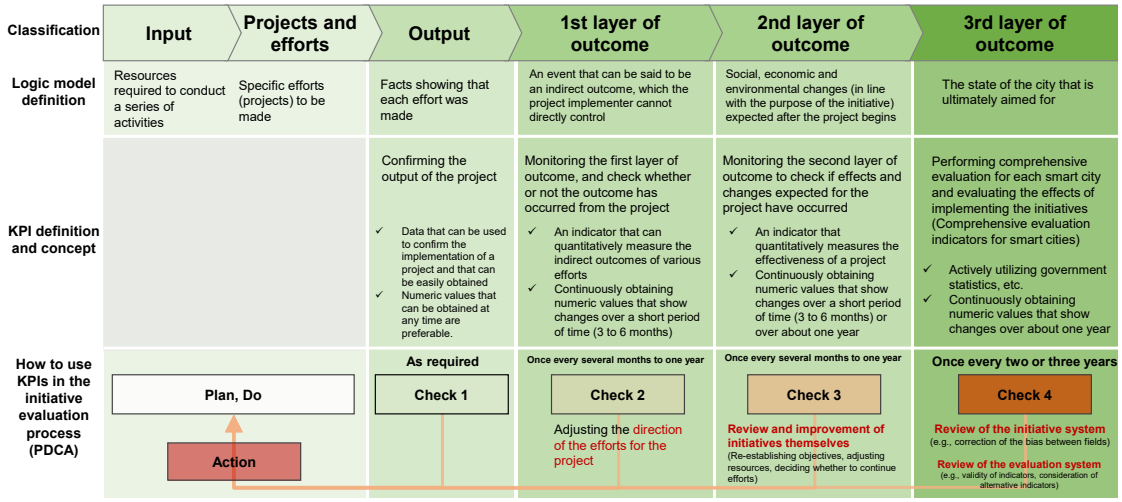
◆ What is KPI?[5]

Abbreviation for Key Performance Indicators

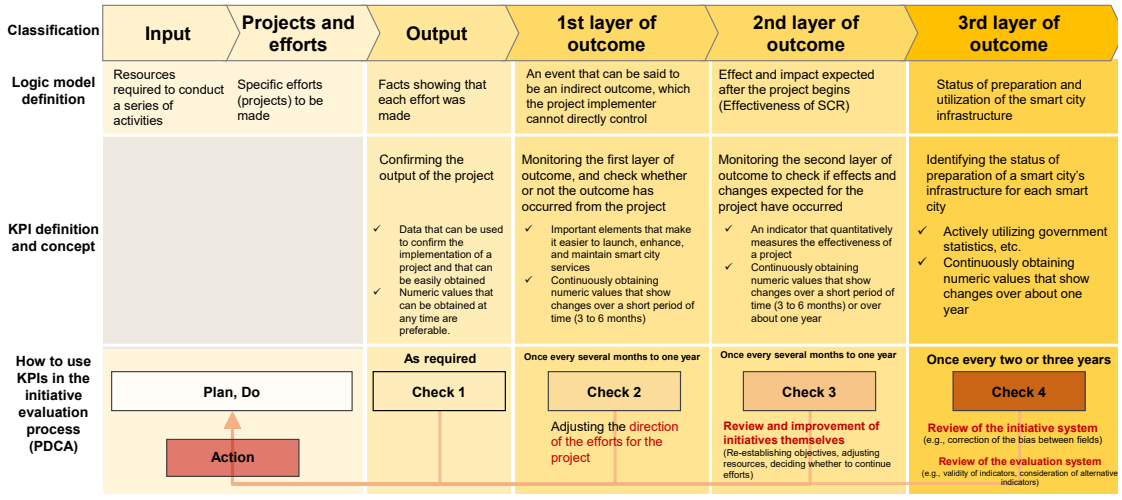
[5] Cabinet Office, Reform Timetable 2018

The approach to setting KPIs at each stage in each field is as shown in the figure below. The deeper the outcome, the longer it takes for the outcome to appear, so the frequency of measuring the KPI decreases.

◆ Approach to setting KPIs in the service field



◆ Approach to setting KPIs in the infrastructure field



2. Approach to Evaluation Indicators

With regard to evaluation indicators, they can be divided into three categories: recommended indicators, selection indicators, and optional indicators, depending on the evaluation field and the logic model.

The recommended indicators are evaluation indicators that are recommended for use in the evaluation field to which the target initiative belongs, and the selection indicators are evaluation indicators for which candidates are presented and from which the community selects the appropriate one. The optional indicators are evaluation indicators that regions freely devise and set, and in this document, the possible indicators for the recommended indicators and the optional indicators are presented in the classification shown in the table below. For the indicators in the infrastructure field, the commonality of the objectives of initiatives is high, so recommended indicators have been set from the first layer of outcome, and selection indicators have not been shown.

◆ Relationships between the logic model classifications and evaluation indicators

Field	Indicator Classification	Recommended Indicator	Selection Indicator	Optional Indicator
Service	Output	—	—	○
	1st layer of outcome	—	—	○
	2nd layer of outcome	○	○	○
	3rd layer of outcome	○	—	○
Infrastructure	Output	—	—	○
	1st layer of outcome	○	—	○
	2nd layer of outcome	○	—	○
	3rd layer of outcome	○	—	○

When considering indicators (KPIs) for regional unique efforts, it is sometimes difficult to find appropriate indicators. In that case, do not force yourself to match the recommended indicators or selection indicators, but rather set your unique own indicators (optional indicators).

For the recommended indicators for the third layer of outcome in the service field, a group of indicators is provided that is common to all initiative themes. For the third layer of outcome in the infrastructure field, there is one recommended indicator. For the second and first layers of outcome in both fields, recommended indicators and selection indicators are shown for each initiative theme.

The indicators presented in this document are divided into those that affect society, those that affect the environment, and those that affect the economy. If you think about what would be a good outcome, it may be easier to set KPIs.

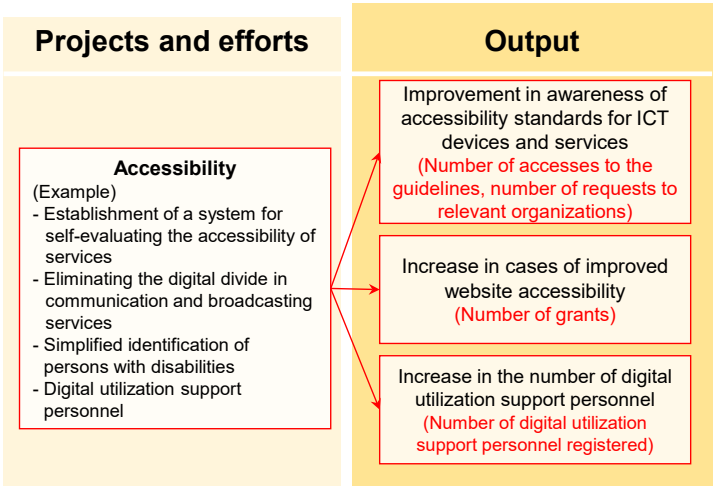
Next, some methods to reduce the workload of obtaining KPIs are introduced.

First of all, in order to avoid placing an excessive burden on the task of obtaining KPIs, it is recommended that you consider using numeric indicators for which you already have data

as KPIs. However, please be careful, as trying to evaluate using existing data too easily is likely to lead to inappropriate evaluation.

Another method is to use numeric values from business reports, etc. If the numeric values and evaluation indicators used in business reports regarding initiatives are appropriate as KPIs, then actively using them will greatly reduce the workload involved in obtaining KPIs.

◆ **Use of numeric values in business reports regarding each initiative (e.g. KPIs for accessibility initiatives and outputs)**



Using urban planning basic investigation and monitoring indicators is also an effective method. If you can use data that is regularly collected for legal investigations, etc., you can significantly reduce the workload involved in obtaining KPIs by actively using it.

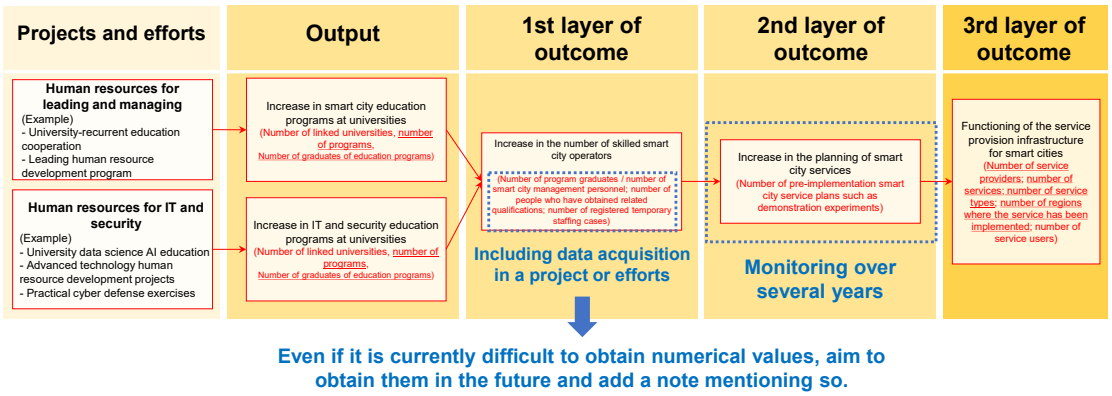
◆ **Use of urban planning basic investigation and monitoring indicators (Example: Investigation items regarding urban planning basic investigation)**

Classification	Data item
Population	Population size, DID, future population, population increase/decrease, commuting/school commuting, daytime population
Industry	Number of employees by industry and occupation, number of establishments, number of employees, sales amount
Land Utilization	Status of zoning, current land use, status of state-owned land, status of residential land development, status of conversion of agricultural land, status of conversion of forest land, new construction trends, ordinances and agreements, status of application of measures related to agriculture, forestry and fisheries
Buildings	Current use of buildings, location status of large-scale retail stores, etc., number of households by type of housing ownership and construction method
Urban Facilities	Location and contents of urban facilities, road conditions

Traffic	Traffic volume, congestion level, and travel speed on major trunk lines; automobile traffic flow; status of railways, streetcars, etc.; bus status
Land Price	Land price status
Natural Environment, etc.	Topography, hydrology, geological conditions, meteorological conditions, flora and fauna investigation
Disasters	Disaster occurrence status, location and maintenance status of disaster prevention facilities
Others (Scenic and historical resources, etc.)	Status of tourism, status of scenic and historical resources, status of recreational facilities, status of pollution

For things that cannot be measured using existing data, it is recommended to include the acquisition of data required for evaluation in your work. For the indicators that are difficult to measure at present but may be possible to measure or obtain in the future (due to technological progress, etc.), it is a good idea to add a note and list them as candidates. The KPIs that are intended to be used to track long-term changes should be monitored over a long-term cycle, such as once every three years, rather than being measured every year.

◆ **Examples of human resource development initiatives**



3. Evaluation Indicators for the Service Field

This section introduces the recommended indicators and selection indicators for each evaluation field in terms of the service field. Please refer to the items regarding the evaluation fields for the initiatives for which logic models have been created, and set appropriate KPIs.

Broad category	Item	Evaluation field	Initiative theme example
Service	a	Mobility	Transportation/mobility, logistics, transportation hub
	b	Environment/ Energy	Environment, energy, water resources, waste
	c	Disaster Prevention/ Crime Prevention	Disaster prevention, crime prevention
	d	Infrastructure/ Facilities	Infrastructure maintenance and management, urban planning and development, facility management, housing, construction, real estate
	e	Health/ Medical Care	Health, medical care, nursing care
	f	Industry/ Economy	Agriculture, forestry and fisheries; tourism and regional revitalization; industry creation and industry-academia cooperation; digital currency and payment; work styles
	g	Local Community	Local community building, local autonomy, social activities
	h	Education/ Culture	Education, child-rearing, culture and art
	i	Government Administration	e-service, digital management

For the third layer of the service field, the following indicators are presented as recommended indicators, and those that are considered to be highly related to each initiative field are explained in each item. Depending on the initiative, there may be cases where an indicator not listed as highly related in this document is actually related and should be set as an indicator, so please select in a flexible manner. Please note that the English titles of the Reference Statistics may not always be accurate.

◆ Recommended indicators for the third layer of outcome in the service field

Indicator	Definition	Reference Statistics
Society		
Housing Prices	Median (percentage) of total rent as a proportion of household income	Housing and Land Survey
Housing Overcrowding Status	Number of rooms per resident	Number of residents per room in terms of households living in houses subjected to Housing and Land Survey
Living Space in a Living Environment	Total floor area per residence	Total floor area per residence in terms of houses subjected to Housing and Land Survey
Fluctuation in Population	Rate of increase/decrease in population	Estimated population
Trend in Life	Average life span	Ministry of Health, Labour and Welfare

	Span		“Life Tables”
	Public Order	Number of criminal offenses recognized per resident	System of Social and Demographic Statistics Reference: National Police Agency “Statistical Data on Criminal Offenses”
	Traffic Accident Fatalities	Number of traffic accident fatalities per 10,000 people	Number of traffic accident fatalities in each municipality in Japan, published annually by the Institute for Traffic Accident Research and Data Analysis
	Traffic Safety	Number (percentage) of traffic accidents per resident	System of Social and Demographic Statistics Reference: Statistics about Road Traffic by prefecture from road traffic statistics
	Medical System in the Event of Disaster	Number (percentage) of disaster base hospitals per resident	Reference: Statistics about Road Traffic by prefecture from road traffic statistics
	Public Transportation Network Performance	Public transportation usage rate	Ministry of Health, Labour and Welfare “List of Disaster Base Hospitals”
	Rate of Young People Going on to Higher Education	Rate of students going on to junior high school in the region	National census Information held by each board of education
	Bachelor Degree Holder Rate	Population with a bachelor's degree or higher (percentage relative to the population aged 25 and over)	National census
	Extent of Childcare Services	Number of children on waiting lists as a percentage relative to the total number of children under elementary school age	Information held by the department that oversees its municipality's childcare facilities
	Extent of Services for Elderly People	Number (percentage) of long-term care welfare facilities for elderly people aged 65 and over	System of Social and Demographic Statistics Survey of long-term care service facilities and businesses
	Extent of Medical Services	Number (percentage) of doctors per resident	Statistics of Physicians, Dentists and Pharmacists
	Working Environment	Average commuting time (minutes) to workplace	Housing and Land Survey
	Government Administration Integrity	Voting rate	Announced by the Ministry of Internal Affairs and Communications for each election
	Geographically-Related Connections	Neighborhood association/town council membership proportion (percentage)	Released on the website of each prefecture and municipality
	Local Cultural Heritage	Number of national treasures and important cultural properties (buildings), number of Japan Heritage sites	Agency for Cultural Affairs Website Information retained by each municipality
	Park Area	Area of parks per capita (percentage)	Information retained by each municipality
Economy			
	Labor Force	Number of employed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
	Potential Labor Force	Number of unemployed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
	Household Income	Median household income	System of Social and Demographic Statistics Reference: Labor force survey
	Gender Gap in Employment Rates	Ratio (percentage) of female workers relative to male workers	System of Social and Demographic Statistics Reference: Labor force survey

	Employment Gap by Nationality	Gap between the percentage of foreign and Japanese workers aged 15 and over (with the percentage of Japanese workers as the denominator)	Basic Complete Tabulation on Labour Force, etc. from the national census
	Disposable Income Gap	Gini coefficient of disposable income of working households	Family Income and Expenditure Survey
	Corporate Bankruptcy	Number (percentage) of bankrupt companies as a proportion relative to all companies	Tokyo Shoko Research, Ltd., "Nationwide Corporate Bankruptcy Situation" Also accessible via the statistics dashboard Number of companies by prefecture in the Basic Survey of Corporate Activities
	Industrial Strength in the Region	Gross regional product per capita	Municipal residents economic calculation
	Financial Base (Local Tax Revenue)	Local tax revenue	Ministry of Internal Affairs and Communications "Municipal Settlement Status Survey"
	Financial Base (Balance of Local Government Bonds)	Balance of local government bonds	Ministry of Internal Affairs and Communications "Municipal Settlement Status Survey"
Environment			
	CO2 Emission Amount From Energy Consumption in the Industrial Sector	CO2 emission amount from energy consumption in the industrial sector per resident	Ministry of the Environment "Municipal Emission Report"
	CO2 Emission Amount From Energy Consumption in the Household Sector	CO2 emission amount from energy consumption in the household sector per resident	Ministry of the Environment "Municipal Emission Report"
	CO2 Emission Amount From Energy Consumption in the Commercial Service Sector	CO2 emission amount from energy consumption in the commercial service sector per resident	Ministry of the Environment "Municipal Emission Report"
	CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 emission amount from energy consumption in the transportation sector per resident	Ministry of the Environment "Municipal Emission Report"
	CO2 Emission Amount From Non-energy Sources	CO2 emission amount from non-energy sources per resident	Ministry of the Environment "Municipal Emission Report"
	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report"
	CO2 Emission Amount Per Unit of Power Generation	CO2 emission amount relative to power generation performance by prefecture	Electricity survey statistics Ministry of the Environment "Greenhouse Gas Emission Calculation, Reporting and Publication System" — Materials announcing the results of the

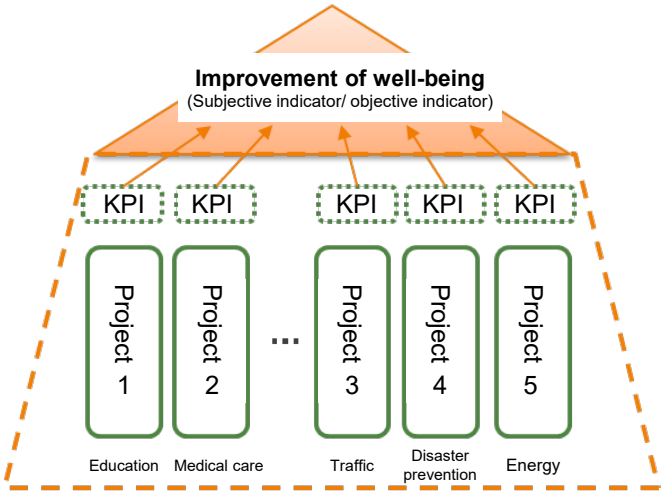
		survey by prefecture
Number of Cars	Number of owned cars per resident	Ministry of Land, Infrastructure, Transport and Tourism “Automobile registration inspection electronic information processing systems” *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.
Urban Waste Emissions	Amount (t) of waste generated per resident	Survey on the current state of general waste disposal
Municipal Waste Disposal Costs	Municipal waste disposal cost per resident (Annual amount in thousands of yen)	Waste disposal business expenses (total for garbage only) from the survey on the current state of general waste disposal
Waste Recycling	Amount of recycling (so-called resource waste) per resident	Amount of recycling found through the survey on the current state of general waste disposal businesses
Recycled Urban Waste	Waste recycling proportion (percentage)	Waste recycling proportion (R) found through the survey on the current state of general waste disposal businesses
Greening Rate	Greening Rate	Publicly released data from municipalities
Forests and Woodland Area	Forest area and woodland area (10,000 ha units)	Agriculture and forestry census (Ministry of Agriculture, Forestry and Fisheries) *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.

The “Vision for a Digital Garden City Nation”, in which smart cities play a role, is a concept that aims to achieve well-being and a sustainable environment, society and economy (sustainability), and regional well-being indicators[6] have been presented as the common indicators for urban development in each region. These regional well-being indicators are not necessarily linked to specific initiatives or businesses, but are comprehensive indicators that measure the well-being of residents.

The third layer of service field outcome in these guidelines is the indicator that forecasts the state that will emerge as a result of implementing specific initiatives and businesses and monitors the state of the city that is ultimately aimed for. It includes indicators related to the well-being of residents (such as part of the content and index of the factors that make up regional well-being indicators). Each region can set KPIs in line with its initiatives as the third layer of service field outcome, while using tools such as regional well-being indicators to support the collection and analysis of data to be used to figure out the well-being of residents.

◆ **Image of regional well-being indicators**

[6] Well-being indicators for digital garden cities, which have been released on the web page below: https://www.digital.go.jp/news/26c0d00b-6625-4e77-8b53-cebcba76a268/


Improvement of well-being
(Subjective indicator/ objective indicator)
KPI
KPI
KPI
KPI
KPI
Project 1
Project 2
...
Project 3
Project 4
Project 5
Education
Medical care
Traffic
Disaster prevention
Energy

a. Mobility

For mobility, there are three theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding traffic/mobility

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Convenience	Time to reach a certain destination	Person trip survey (Average time required)
Selection Indicator	Society	Accessibility of the entire city	Accessibility of each location (T indicator)	Walking time + public transportation time + expected waiting time for public transportation (Expected waiting time = 60 minutes / number of runs per hour / 2)
		Accessibility of the entire city	Accessibility of the entire city (P indicator)	Resident population within a certain time of the T indicator of the target service facility / population of the entire city
		Rate of people going out	Percentage of people who go out on a given day	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Congestion rate of the relevant mobility or local public transportation	Congestion rate (passengers transported ÷ transportation capacity) defined by the Ministry of Land, Infrastructure, Transport and Tourism	Ministry of Land, Infrastructure, Transport and Tourism “Railways in Figures” etc.
		Mobility satisfaction	Percentage of the residents who are satisfied with the relevant mobility	Results of a survey of users of the relevant mobility
	Economy	Operational efficiency	Volume transported per kilometer traveled, fare revenue per kilometer traveled, volume transported per driver	Information known to the management of the relevant mobility
		Mobility profitability	Value obtained by subtracting operating expenses from the fare per actual user	Information known to the management of the relevant mobility
		Circular/excursion properties	Average number of trips and number of places visited in the relevant region in person trip survey	Person trip survey
		Economic loss due to congestion	Avoidance rate of the relevant mobility due to congestion	Results of a survey of users of the relevant mobility
		Visitor attraction rate of the base	Number of visitors to the relevant base	Information known to the management of the relevant mobility
		Impact on local transportation business operators	Sales of transportation business operators in other regions compared to the previous year	Financial statements of business operators
		Spillover effects on other industries	Sales of business operators in other industries compared to the previous year	Financial statements of business operators
		Benefits of cooperation with other industries	Sales of business operators in cooperation compared to the previous year	Financial statements of business operators
		Job-to-applicant rate for drivers	Value obtained by dividing the number of job offers (for drivers) by the number of job	Information known to the management of the relevant mobility

Type		Indicator	Definition	Calculation Method
			seekers	
	Environment	Car usage rate	Percentage of car use relative to the total transportation use	Person trip survey
		Public transportation usage rate	Percentage of public transportation use relative to the total transportation use	Person trip survey
		CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 Emission Amount From Energy Consumption in the Transportation Sector	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ **Indicators for the second layer of outcome regarding logistics**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Logistics efficiency	Redelivery rate	Information known to the management of the relevant logistics
Selection Indicator	Society	Convenience	Percentage of online re-delivery reservations	Information known to the management of the relevant logistics
		Rate of people going out	Percentage of people who go out on a given day	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Service quality	Percentage of incidents of soiling and damage	Information known to the management of the relevant logistics
		Quality of life in logistics	Percentage of occurrences of delay and violation of time specifications	Information known to the management of the relevant logistics
	Economy	Job-to-applicant rate for drivers	Value obtained by dividing the number of job offers (for drivers) by the number of job seekers	Information known to the management of the relevant logistics
	Environment	Emergency transportation in the event of disaster	Number of surplus vehicles held by each business operator	Information known to the management of the relevant logistics

◆ **Indicators for the second layer of outcome regarding transportation hubs**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Rise in land prices in the surrounding areas due to the development of transportation hubs	Land prices in the surrounding area	Real estate transaction-price information from the Land Information System, etc.
Selection Indicator	Society	Facilitating smooth traffic flow by developing transportation hubs	Number of traffic accidents (Number (percentage) of traffic accidents per resident)	System of Social and Demographic Statistics Reference: Statistics about Road Traffic by prefecture from road traffic statistics * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

Type		Indicator	Definition	Calculation Method
		Improved convenience by developing transportation hubs	Number of users of transportation hubs	Information known to the management of the relevant transportation hub
	Economy	Impact on the tourism industry in wide areas	Annual number of tourists	Japan Tourism Agency “Tourist Statistics Based on the Common Standards”
	Environment	Improvement of disaster prevention functions	Number of people who have difficulty returning home that can be accepted	Calculation based on the capacity intended at the time of facility planning
		Public transportation usage rate	Percentage of public transportation use relative to the total transportation use	Person trip survey
		CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 Emission Amount From Energy Consumption in the Transportation Sector	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

The following are the recommended indicators for the third layer of outcome, which is closely related to the mobility field:

◆ Recommended indicators for the third layer of outcome, which is closely related to the mobility field

Indicator	Definition	Reference Statistics
Society		
Traffic Accident Fatalities	Number of traffic accident fatalities per 10,000 people	Number of traffic accident fatalities in each municipality in Japan, published annually by the Institute for Traffic Accident Research and Data Analysis
Traffic Safety	Number (percentage) of traffic accidents per resident	System of Social and Demographic Statistics Reference: Statistics about Road Traffic by prefecture from road traffic statistics
Public Transportation Network Performance	Public transportation usage rate	Ministry of Health, Labour and Welfare “List of Disaster Base Hospitals”
Working Environment	Average commuting time (minutes) to workplace	Housing and Land Survey
Environment		
CO2 Emission Amount From Energy Consumption in the Industrial Sector	CO2 emission amount from energy consumption in the industrial sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in the Household Sector	CO2 emission amount from energy consumption in the household sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in	CO2 emission amount from energy consumption in the commercial service sector per resident	Ministry of the Environment “Municipal Emission Report”

	the Commercial Service Sector		
	CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 emission amount from energy consumption in the transportation sector per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Non-energy Sources	CO2 emission amount from non-energy sources per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount Per Unit of Power Generation	CO2 emission amount relative to power generation performance by prefecture	Electricity survey statistics Ministry of the Environment “Greenhouse Gas Emission Calculation, Reporting and Publication System” — Materials announcing the results of the survey by prefecture
	Number of Cars	Number of owned cars per resident	Ministry of Land, Infrastructure, Transport and Tourism “Automobile registration inspection electronic information processing systems” *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.
	Urban Waste Emissions	Amount (t) of waste generated per resident	Survey on the current state of general waste disposal
	Municipal Waste Disposal Costs	Municipal waste disposal cost per resident (Annual amount in thousands of yen)	Waste disposal business expenses (total for garbage only) from the survey on the current state of general waste disposal
	Waste Recycling	Amount of recycling (so-called resource waste) per resident	Amount of recycling found through the survey on the current state of general waste disposal businesses
	Recycled Urban Waste	Waste recycling proportion (percentage)	Waste recycling proportion (R) found through the survey on the current state of general waste disposal businesses

b. Environment/ Energy

For environment and energy, there are four theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding environment

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Environment	Air pollution	Airborne concentrations of PM2.5, photochemical oxidant, etc.	Results of measuring the target substance in the atmosphere
Selection Indicator	Society	Costs borne by residents and industry to improve the environment	Amount invested in various equipment and facilities to improve the environment	Based on voluntary reporting by residents and companies participating in projects
		Comfort	Percentage of people living comfortably	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Quality of life in thermal environments	Degree of dependence on air conditioning and heating equipment	Total investment amount (equipment costs, electricity costs, gas costs, etc.) for cooling and heating in large facilities
		Environmental awareness activities	Number of events held to raise the awareness of environmental issues	Number of articles published in municipal newsletters, etc.
	Economy	Energy utilization efficiency	Primary energy consumption compared to the previous year	Annual monitoring of the amount by which primary energy consumption is reduced through the implementation of initiatives
		Rate of self-generation	Percentage of houses equipped with self-generation systems such as solar power generation and storage batteries	In municipalities where subsidies are available, the number of subsidies, cooperation with business operators, etc.
		Local production for local energy consumption	Rate of local supply of renewable energy	Calculation based on data such as public relations values of energy companies
	Environment	Reduction rate of primary energy	Primary energy consumption	Sum of direct energy consumption associated with the use of local buildings
		CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span
		Automobile CO2 emission	Automobile CO2 emission per citizen (Gasoline consumption per vehicle-kilometer)	Road traffic census

◆ Indicators for the second layer of outcome regarding energy *No recommended indicators

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Costs borne by residents and industry to improve the environment	Amount invested in various equipment and facilities to improve the environment	Based on voluntary reporting by residents and companies participating in projects

Type		Indicator	Definition	Calculation Method
		Comfort	Percentage of people living comfortably	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Quality of life in thermal environments	Degree of dependence on air conditioning and heating equipment	Total investment amount (equipment costs, electricity costs, gas costs, etc.) for cooling and heating in large facilities
		Energy-related awareness activities	Number of energy-related awareness events	Number of articles published in municipal newsletters, etc.
	Economy	Energy utilization efficiency	Primary energy consumption compared to the previous year	Annual monitoring of the amount by which primary energy consumption is reduced through the implementation of initiatives
		Rate of self-generation	Percentage of houses equipped with self-generation systems such as solar power generation and storage batteries	In municipalities where subsidies are available, the number of subsidies, cooperation with business operators, etc.
		Local production for local energy consumption	Rate of local supply of renewable energy	Calculation based on data such as public relations values of energy companies
	Environment	Reduction rate of primary energy	Primary energy consumption	Sum of direct energy consumption associated with the use of local buildings

◆ **Indicators for the second layer of outcome regarding water resources**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Environment	Conservation of regional water resources	Measurement results for BOD, COD, etc. in rivers, lakes, marshes, etc.	Measurement results for the target substances in rivers, lakes, marshes, etc.
Selection Indicator	Society	Costs borne by residents and industry to improve the environment	Amount invested in various equipment and facilities to improve the environment	Based on voluntary reporting by residents and companies participating in projects
		Comfort	Percentage of people living comfortably	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Quality of life in thermal environments	Degree of dependence on air conditioning and heating equipment	Total investment amount (equipment costs, electricity costs, gas costs, etc.) for cooling and heating in large facilities
		Water resource-related awareness activities	Number of water resource-related awareness events	Number of articles published in municipal newsletters, etc.
	Economy	Energy utilization efficiency	Primary energy consumption compared to the previous year	Annual monitoring of the amount by which primary energy consumption is reduced through the implementation of initiatives
		Local production for local energy consumption	Rate of local supply of renewable energy	Calculation based on data such as public relations values of energy companies
	Environment	Reduction rate of primary energy	Primary energy consumption	Sum of direct energy consumption associated with the use of local buildings
		CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ **Indicators for the second layer of outcome regarding waste**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Environment	Air pollution	Airborne concentrations of PM2.5, photochemical oxidant, etc.	Results of measuring the target substance in the atmosphere
Selection Indicator	Society	Costs borne by residents and industry to improve the environment	Amount invested in various equipment and facilities to improve the environment	Based on voluntary reporting by residents and companies participating in projects
		Comfort	Percentage of people living comfortably	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Quality of life in thermal environments	Degree of dependence on air conditioning and heating equipment	Total investment amount (equipment costs, electricity costs, gas costs, etc.) for cooling and heating in large facilities
		Waste-related awareness activities	Number of waste-related awareness events	Number of articles published in municipal newsletters, etc.
	Economy	Energy utilization efficiency	Primary energy consumption compared to the previous year	Annual monitoring of the amount by which primary energy consumption is reduced through the implementation of initiatives
		Waste recycling proportion (percentage)	Waste recycling proportion (R) found through the survey on the current state of general waste disposal businesses	Survey on the current state of general waste disposal * Same indicator as the recommended indicator for the third layer, but measured over a shorter span
		Local production for local energy consumption	Rate of local supply of renewable energy	Calculation based on data such as public relations values of energy companies
	Environment	Reduction rate of primary energy	Primary energy consumption	Sum of direct energy consumption associated with the use of local buildings
		CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

The following are the recommended indicators for the third layer of outcome, which is closely related to the environment/energy field:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the environment/energy field**

Indicator	Definition	Reference Statistics
Environment		
CO2 Emission Amount From Energy Consumption in the Industrial Sector	CO2 emission amount from energy consumption in the industrial sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in the Household	CO2 emission amount from energy consumption in the household sector per resident	Ministry of the Environment “Municipal Emission Report”

Sector		
CO2 Emission Amount From Energy Consumption in the Commercial Service Sector	CO2 emission amount from energy consumption in the commercial service sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 emission amount from energy consumption in the transportation sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Non-energy Sources	CO2 emission amount from non-energy sources per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount Per Unit of Power Generation	CO2 emission amount relative to power generation performance by prefecture	Electricity survey statistics Ministry of the Environment “Greenhouse Gas Emission Calculation, Reporting and Publication System” — Materials announcing the results of the survey by prefecture
Number of Cars	Number of owned cars per resident	Ministry of Land, Infrastructure, Transport and Tourism “Automobile registration inspection electronic information processing systems” *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.
Urban Waste Emissions	Amount (t) of waste generated per resident	Survey on the current state of general waste disposal
Municipal Waste Disposal Costs	Municipal waste disposal cost per resident (Annual amount in thousands of yen)	Waste disposal business expenses (total for garbage only) from the survey on the current state of general waste disposal
Waste Recycling	Amount of recycling (so-called resource waste) per resident	Amount of recycling found through the survey on the current state of general waste disposal businesses
Recycled Urban Waste	Waste recycling proportion (percentage)	Waste recycling proportion (R) found through the survey on the current state of general waste disposal businesses

c. Disaster Prevention/ Crime Prevention

For disaster and crime prevention, there are two theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding disaster prevention

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Evacuation route	Average distance to the nearest emergency evacuation site	Housing and Land Survey — Prefecture edition
Selection Indicator	Society	Efficiency in responding to disasters	Time (minutes) from disaster occurrence to the opening of evacuation centers	Actual performance values when evacuation centers are also set up
		Government disaster response	Resident satisfaction degree with the government disaster response	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Safety and security of residential areas	Percentage of people who feel that the area where they live is safe and secure	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Disaster prevention in residential areas	Percentage of people living in areas of concern for disaster prevention	Calculated by dividing the following population by the total population of the city: people living in areas designated by the city, based on disaster prevention plans and regional conditions, etc.
		Vacant house rate in terms of vacant houses having dangerous and harmful properties	Divide the number of specified vacant houses (other residences) by the total number of residences	Housing and Land Survey
	Environment	Energy-saving measures at evacuation centers	Percentage of evacuation centers that are working to save energy	Evaluating energy-saving subsidies for facilities designated as evacuation centers and the efforts of each facility

◆ Indicators for the second layer of outcome regarding crime prevention

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Vacant house rate	Divide the number of vacant houses (other residences) by the total number of residences	Housing and Land Survey
	Economy	Unemployment	Unemployment rate in a	Labor force survey

Type		Indicator	Definition	Calculation Method
		rate	labor force survey	
Selection Indicator	Society	Safety and security of residential areas	Percentage of people who feel that the area where they live is safe and secure	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Fostering a sense of belonging	Attachment to the town where they live (e.g. whether they feel it is their hometown)	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Child helpline	Number of houses (shops) that serve for child helpline	Number of registrations in neighborhood associations and town councils
	Economy	Poverty rate	Percentage of household members below the poverty line	Calculating the poverty line for the municipality in accordance with the definition of the poverty line in the Comprehensive Survey of Living Conditions, and the relative poverty rate as the percentage of household members below the poverty line

The following are the recommended indicators for the third layer of outcome, which is closely related to the disaster and crime prevention fields:

◆ Recommended indicators for the third layer of outcome, which is closely related to the disaster and crime prevention fields

Indicator	Definition	Reference Statistics
Society		
Public Order	Number of criminal offenses recognized per resident	System of Social and Demographic Statistics Reference: National Police Agency "Statistical Data on Criminal Offenses"
Medical System in the Event of Disaster	Number (percentage) of disaster base hospitals per resident	Reference: Statistics about Road Traffic by prefecture from road traffic statistics

d. Infrastructure/ Facilities

For infrastructure and facilities, there are six theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding infrastructure maintenance and management

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Number of residents in the region	Number of residents compared to the previous year (Number of people in the region)	Ministry of Internal Affairs and Communications “Surveys of Population, Population Change and the Number of Households based on the Basic Resident Registration (as of January 1, 2022)”
Selection Indicator	Society	Working environment for infrastructure maintenance managers	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
		Infrastructure maintenance manager safety	Number of industrial accidents at the relevant infrastructure	Ministry of Health, Labour and Welfare “Report on the Occurrence of Industrial Accidents”
		Turnover rate of infrastructure maintenance managers	Turnover rate	Survey on Employment Trends
	Economy	Value added (Construction industry)	Value added (Construction industry)	System of Social and Demographic Statistics
		Maintenance and repair costs	Maintenance and repair costs *Measurement of trends	System of Social and Demographic Statistics
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ Indicators for the second layer of outcome regarding urban planning and development

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Number of residents in the region	Number of residents compared to the previous year (Number of people in the region)	Ministry of Internal Affairs and Communications “Surveys of Population, Population Change and the Number of Households based on the Basic Resident Registration (as of January 1, 2022)”
Selection Indicator	Society	Working environment for urban planning and development workers	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
		Urban planning and development worker safety	Number of industrial accidents in urban planning areas	Ministry of Health, Labour and Welfare “Report on the Occurrence of Industrial Accidents”
	Economy	Urban planning	Urban planning costs	System of Social and

Type		Indicator	Definition	Calculation Method
		costs	*Measurement of trends	Demographic Statistics
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ Indicators for the second layer of outcome regarding facility management

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Number of residents in the region	Number of residents compared to the previous year (Number of people in the region)	Ministry of Internal Affairs and Communications “Surveys of Population, Population Change and the Number of Households based on the Basic Resident Registration (as of January 1, 2022)”
Selection Indicator	Society	Working environment for facility management personnel	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
		Facility management personnel safety	Number of industrial accidents among facility management personnel	Ministry of Health, Labour and Welfare “Report on the Occurrence of Industrial Accidents”
		Comfort and convenience of facilities	Distance (minutes) from the nearest public transportation	Calculated as 80 m = 1 minute (4.8 km/h)
		Quality of life in thermal environments	Degree of dependence on air conditioning and heating equipment	Total investment amount (equipment costs, electricity costs, gas costs, etc.) for cooling and heating in large facilities
	Economy	Facility revenue	Number of facility users	Information known to the manager of the relevant facility
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ Indicators for the second layer of outcome regarding housing

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Number of residents in the region	Number of residents compared to the previous year (Number of people in the region)	Ministry of Internal Affairs and Communications “Surveys of Population, Population Change and the Number of Households based on the Basic Resident Registration (as of January 1, 2022)”
Selection Indicator	Society	Labor environment at a home builder	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
		Safety at a home builder	Number of industrial accidents at a home builder	Ministry of Health, Labour and Welfare “Report on the Occurrence of Industrial Accidents”
	Economy	Home	Home ownership rate in the	Housing and Land Survey

Type		Indicator	Definition	Calculation Method
		ownership rate	region	
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ **Indicators for the second layer of outcome regarding construction**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Number of residents in the region	Number of residents compared to the previous year (Number of people in the region)	Ministry of Internal Affairs and Communications "Surveys of Population, Population Change and the Number of Households based on the Basic Resident Registration (as of January 1, 2022)"
Selection Indicator	Society	Working environment for construction workers	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
		Construction worker safety	Number of industrial accidents among construction workers	Ministry of Health, Labour and Welfare "Report on the Occurrence of Industrial Accidents"
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ **Indicators for the second layer of outcome regarding real estate**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Number of residents in the region	Number of residents compared to the previous year (Number of people in the region)	Ministry of Internal Affairs and Communications "Surveys of Population, Population Change and the Number of Households based on the Basic Resident Registration (as of January 1, 2022)"
Selection Indicator	Society	Working environment for real estate agent workers	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

The following are the recommended indicators for the third layer of outcome, which is closely related to the infrastructure/facility field:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the infrastructure/facility field**

Indicator	Definition	Reference Statistics
Society		

Housing Prices	Median (percentage) of total rent as a proportion of household income	Housing and Land Survey
Housing Overcrowding Status	Number of rooms per resident	Number of residents per room in terms of households living in houses subjected to Housing and Land Survey
Living Space in a Living Environment	Total floor area per residence	Total floor area per residence in terms of houses subjected to Housing and Land Survey
Traffic Accident Fatalities	Number of traffic accident fatalities per 10,000 people	Number of traffic accident fatalities in each municipality in Japan, published annually by the Institute for Traffic Accident Research and Data Analysis
Traffic Safety	Number (percentage) of traffic accidents per resident	System of Social and Demographic Statistics Reference: Statistics about Road Traffic by prefecture from road traffic statistics
Medical System in the Event of Disaster	Number (percentage) of disaster base hospitals per resident	Reference: Statistics about Road Traffic by prefecture from road traffic statistics
Public Transportation Network Performance	Public transportation usage rate	Ministry of Health, Labour and Welfare “List of Disaster Base Hospitals”
Park Area	Area of parks per capita (percentage)	Information retained by each municipality
Financial Base (Balance of Local Government Bonds)	Balance of local government bonds	Ministry of Internal Affairs and Communications “Municipal Settlement Status Survey”
Environment		
CO2 Emission Amount From Energy Consumption in the Industrial Sector	CO2 emission amount from energy consumption in the industrial sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in the Household Sector	CO2 emission amount from energy consumption in the household sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in the Commercial Service Sector	CO2 emission amount from energy consumption in the commercial service sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 emission amount from energy consumption in the transportation sector per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Non-energy Sources	CO2 emission amount from non-energy sources per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report”
CO2 Emission Amount Per Unit of Power	CO2 emission amount relative to power generation performance by prefecture	Electricity survey statistics Ministry of the Environment “Greenhouse Gas Emission Calculation, Reporting and

	Generation		Publication System" — Materials announcing the results of the survey by prefecture
	Number of Cars	Number of owned cars per resident	Ministry of Land, Infrastructure, Transport and Tourism "Automobile registration inspection electronic information processing systems" *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.
	Urban Waste Emissions	Amount (t) of waste generated per resident	Survey on the current state of general waste disposal
	Municipal Waste Disposal Costs	Municipal waste disposal cost per resident (Annual amount in thousands of yen)	Waste disposal business expenses (total for garbage only) from the survey on the current state of general waste disposal
	Waste Recycling	Amount of recycling (so-called resource waste) per resident	Amount of recycling found through the survey on the current state of general waste disposal businesses
	Recycled Urban Waste	Waste recycling proportion (percentage)	Waste recycling proportion (R) found through the survey on the current state of general waste disposal businesses
	Greening Rate	Greening Rate	Publicly released data from municipalities
	Forests and Woodland Area	Forest area and woodland area (10,000 ha units)	Agriculture and forestry census (Ministry of Agriculture, Forestry and Fisheries) *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.

e. Health/ Medical Care

For health and medical care, there are three theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding health

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Health consciousness	Percentage of people with metabolic syndrome and those at risk of metabolic syndrome relative to the total population	Data from specific health checkups covered by the National Health Insurance System
		Improvement in health awareness	Implementation rate of Specific Health Checkups and Specific Health Guidance covered by the National Health Insurance System in municipalities	Status of implementation of Specific Health Checkups and Specific Health Guidance (by insurer), released by the Ministry of Health, Labour and Welfare
	Environment	Smoking rate	Adult smoking rate	Comprehensive Survey of Living Conditions
Selection Indicator	Society	Average life span	Average life span in the region	Ministry of Health, Labour and Welfare "Life Tables"
		Steps taken in daily life	Amount of walking (number of steps) in daily life	National Health and Nutrition Survey
	Economy	Medical expenses	Medical expense per resident	Ministry of Health, Labour and Welfare "Overview of National Medical Care Expenditure"
		Regional differences in medical expenses	Actual medical expense per resident and comparison with the national average	Ministry of Health, Labour and Welfare "Analysis of Regional Differences in Medical Expenses"
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

Type		Indicator	Definition	Calculation Method
		Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Public transportation usage	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Nationwide Person Trip Survey Person trip survey in each urban area

◆ **Indicators for the second layer of outcome regarding medical care**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Comfort in medical care	Percentage of houses without a medical institution within elderly walking distance	Housing and Land Survey — Prefecture edition * Number of houses by distance to the nearest medical institution
	Economy	Medical expenses	Medical expense per resident	Ministry of Health, Labour and Welfare "Overview of National Medical Care Expenditure"
	Environment	Smoking rate	Adult smoking rate	Comprehensive Survey of Living Conditions
Selection Indicator	Society	Quality of life in medical care	Number of diabetes inpatients per resident	Patient survey
		Working environment for workers	Degree of contribution to the management system for improving working environments	Whether or not the workplace has been improved in accordance with the working environment improvement promotion for medical personnel promoted by the Ministry of Health, Labour and Welfare
		Percentage of active doctors	Percentage of doctors actually working (excluding doctors who have licenses but are not working) relative to the total number of doctors in the region	Information held by the medical association in the region, etc.
	Economy	Medical personnel productivity	Medical expense per doctor in the region	Multiply the per-resident medical expense by the number of residents and divide the result by the number of doctors
		Regional differences in medical expenses	Actual medical expense per resident and comparison with the national average	Ministry of Health, Labour and Welfare "Analysis of Regional Differences in Medical Expenses"

◆ **Indicators for the second layer of outcome regarding nursing care**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Comfort in nursing care	Percentage of elderly population covered by the welfare facility for elderly people within a 1 km radius of the facility	Housing and Land Survey — Prefecture edition * Number of houses by distance to the welfare facility
	Economy	Nursing-care insurance premium by region	Insurance benefit per resident	Ministry of Health, Labour and Welfare "Announcement of the Amount of Nursing Care Insurance Premium and Benefit Levels, by Region Nationwide"
Selection Indicator	Society	Quality of life in nursing care	Percentage of houses without a park within elderly walking distance	Housing and Land Survey — Prefecture edition * Number of houses by distance to

Type		Indicator	Definition	Calculation Method
				the nearest park
		Working environment for workers	Rate of participation in training courses for employment management officers at welfare facilities in the region	Percentage of welfare facilities in the region that have a supervisor who has received training provided by the Care Work Foundation
	Economy	Nursing care insurance service expense	Nursing care insurance service expense per category one insured person	Ministry of Health, Labour and Welfare “Nursing Care Insurance Business Situation Report”
		Care worker productivity	Insurance benefit per care worker in the region	Multiply the per-resident insurance benefit by the number of residents and divide the result by the number of doctors
		Regional differences in the standard of nursing care	Number of home-visit nursing stations per 100,000 people	Survey of long-term care service facilities and businesses
	Environment	Energy conservation at welfare facilities	Percentage of welfare facilities that are working to save energy	Evaluating energy-saving subsidies for facilities designated as welfare facilities and the efforts of each facility

The following are the recommended indicators for the third layer of outcome, which is closely related to the health and medical fields:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the health and medical fields**

Indicator	Definition	Reference Statistics
Society		
Fluctuation in Population	Rate of increase/decrease in population	Estimated population
Trend in Life Span	Average life span	Ministry of Health, Labour and Welfare “Life Tables”
Medical System in the Event of Disaster	Number (percentage) of disaster base hospitals per resident	Reference: Statistics about Road Traffic by prefecture from road traffic statistics
Extent of Childcare Services	Number of children on waiting lists as a percentage relative to the total number of children under elementary school age	Information held by the department that oversees its municipality's childcare facilities
Extent of Services for Elderly People	Number (percentage) of long-term care welfare facilities for elderly people aged 65 and over	System of Social and Demographic Statistics Survey of long-term care service facilities and businesses
Extent of Medical Services	Number (percentage) of doctors per resident	Statistics of Physicians, Dentists and Pharmacists

f. Industry/ Economy

For industry and economy, there are five theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ **Indicators for the second layer of outcome regarding agriculture, forestry, and fisheries**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Work efficiency in agriculture,	Area (ha) of cultivated land per farmer	System of Social and Demographic Statistics

Type		Indicator	Definition	Calculation Method
		forestry, and fisheries		
Selection Indicator	Economy	Number of business locations	Number of business locations (agriculture and forestry); number of business locations (fisheries) * Figuring out as an indicator for the whole and for the private sector separately is possible.	System of Social and Demographic Statistics
		Number of employees	Number of employees (agriculture and forestry); number of employees (fisheries)	System of Social and Demographic Statistics
		Agricultural production value amount	Agricultural production value amount	System of Social and Demographic Statistics
		Number of farming households	Number of farming households (selling farmers); number of farming households (subsistence farmers); number of full-time and part-time farming households (selling farmers)	System of Social and Demographic Statistics
		Number of farmers, fishermen and forestry workers	Number of farmers, fishermen and forestry workers; number of people employed in agriculture, forestry, and fisheries	System of Social and Demographic Statistics
		Decrease in damage caused by birds and animals	Damage to crops caused by wild birds and animals	Data held by municipalities
		Area of cultivated-land abandoned	Area (ha) of cultivated-land abandoned	System of Social and Demographic Statistics
		Sustainability in agriculture, forestry and fisheries	Sales amount (agriculture, forestry and fisheries); added value (agriculture, forestry and fisheries)	System of Social and Demographic Statistics
	Environment	Forest area	Forest area (ha)	System of Social and Demographic Statistics
		Woodland area	Woodland area (ha)	System of Social and Demographic Statistics
		CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ **Indicators for the second layer of outcome regarding tourism and regional revitalization**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Economy	Excursion/circular properties	Average number of trips and number of places visited in the relevant region in person trip survey	Person trip survey
Selection Indicator	Economy	Liveliness (Crowdedness)	Number (1000 people) of tourists visiting tourist attractions	National tourism statistics (by prefecture)
		Liveliness (Amount spent)	Average amount spent per tourist visiting tourist attractions (yen per person)	National tourism statistics (by prefecture)
		Sales of the tourist	Total amount of consumption	National tourism statistics

Type		Indicator	Definition	Calculation Method
		industry	(in millions of yen) by tourists visiting tourist attractions	(by prefecture)
		Number of business locations	Number of business locations (Manufacturing, wholesale, retail, accommodation, food/drink service, lifestyle-related service, entertainment, composite service, other services (not elsewhere classified)) * Statistics are available for the total number and private sectors separately.	System of Social and Demographic Statistics
		Number of employees	Number of employees (Manufacturing, wholesale, retail, accommodation, food/drink service, lifestyle-related service, entertainment, composite service, other services (not elsewhere classified))	System of Social and Demographic Statistics
		Annual product sales	Annual sales of merchandise (retail plus wholesale); annual sales of wholesale merchandise; annual sales of retail merchandise	System of Social and Demographic Statistics
		Standard price	Standard (average) prices for residential, commercial and industrial land	System of Social and Demographic Statistics
		Sales amount	Amount of sales by companies (in millions of yen) (Manufacturing, wholesale, retail, accommodation, food/drink service, lifestyle-related service, entertainment, composite service, other services (not elsewhere classified))	System of Social and Demographic Statistics
		Value Added	Value created by companies through their business activities (in millions of yen) (Manufacturing, wholesale, retail, accommodation, food/drink service, lifestyle-related service, entertainment, composite service, other services (not elsewhere classified))	System of Social and Demographic Statistics
		Number of nights stayed	Municipality-each, number of nights stayed	Calculation based on JNTO “Comparison of Municipality-each Movement”
	Environment	Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

◆ **Indicators for the second layer of outcome regarding industry creation and industry-academia cooperation**

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Number of people moving in	Number of people moving in * Statistics are available separately for the total number and Japanese migrants	System of Social and Demographic Statistics
Selection Indicator	Society	Number of people moving out	Number of people moving out * Statistics are available separately for the total number and Japanese migrants	System of Social and Demographic Statistics
		Bearer	Number of engineers; number of professionals; number of skilled workers	System of Social and Demographic Statistics
		Percentage of people who have received higher education	Percentage of people aged 25 to 64 who have received higher education	National census (Ministry of Internal Affairs and Communications)
	Economy	Number of employees	Number of employees * Statistics are available for the number of people excluding public service and the private sectors (academic research, specialized/technical services) separately.	System of Social and Demographic Statistics
		Taxable income	Taxable income (in thousands of yen)	System of Social and Demographic Statistics
		Productivity improvement	Value added (in millions of yen) (Value created by the company through its business activities)	System of Social and Demographic Statistics
		Number of new industries created	Number of new industries created	Number certified by the municipality
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ Indicators for the second layer of outcome regarding digital currency and payment

*No recommended indicators

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Number of criminal law violations recognized	Number of criminal law violations recognized (Number of cases)	System of Social and Demographic Statistics
	Economy	Sales amount	Sales amount (in millions of yen) (Private sector)	System of Social and Demographic Statistics

◆ Indicators for the second layer of outcome regarding work styles and working environments

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Business attraction	Number of businesses attracted	Number of businesses attracted by the municipality
Selection Indicator	Society	Working Environment	Number of days worked per year * 240 days is the number of days a year that a typical company or business with a five-day work week is open for business.	Monthly labor survey
		Hours worked in excess of regular hours	Hours worked in excess of regular hours (Unit: Hour)	System of Social and Demographic Statistics
		Population influx	Population influx	System of Social and

Type		Indicator	Definition	Calculation Method
			* Population that works or goes to school in other municipalities in the prefecture; population that works or goes to school in other prefectures; population that resides in other municipalities in the prefecture; population that resides in other prefectures	Demographic Statistics
		Daytime population	Daytime population (Unit: Person)	System of Social and Demographic Statistics
		Day-to-night population ratio	Day-to-night population ratio (%)	System of Social and Demographic Statistics
	Economy	Productivity improvement	Value added (in millions of yen) (Value created by the company through its business activities)	System of Social and Demographic Statistics
		Unemployment rate	Unemployment rate (%)	System of Social and Demographic Statistics
		Added value for companies that have implemented work style reform	Value obtained by dividing the added value of the company by the number of employees (yen/person)	Companies that have implemented work style reform are certified as Kurumin (people moving to the capital), etc. System of Social and Demographic Statistics
	Environment	Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

The following are the recommended indicators for the third layer of outcome, which is closely related to the industry and economy fields:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the industry and economy fields**

Indicator	Definition	Reference Statistics
Society		
Fluctuation in Population	Rate of increase/decrease in population	Estimated population
Trend in Life Span	Average life span	Ministry of Health, Labour and Welfare “Life Tables”
Working Environment	Average commuting time (minutes) to workplace	Housing and Land Survey
Economy		
Labor Force	Number of employed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
Potential Labor Force	Number of unemployed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
Household Income	Median household income	System of Social and Demographic Statistics Reference: Labor force survey
Gender Gap in Employment Rates	Ratio (percentage) of female workers relative to male workers	System of Social and Demographic Statistics Reference: Labor force survey
Employment Gap by Nationality	Gap between the percentage of foreign and Japanese workers aged 15 and over (with the percentage of Japanese workers as the denominator)	Basic Complete Tabulation on Labour Force, etc. from the national census
Disposable	Gini coefficient of disposable income of	Family Income and Expenditure Survey

	Income Gap	working households	
	Corporate Bankruptcy	Number (percentage) of bankrupt companies as a proportion relative to all companies	Tokyo Shoko Research, Ltd., “Nationwide Corporate Bankruptcy Situation” Also accessible via the statistics dashboard Number of companies by prefecture in the Basic Survey of Corporate Activities
	Industrial Strength in the Region	Gross regional product per capita	Municipal residents economic calculation
Environment			
	CO2 Emission Amount From Energy Consumption in the Industrial Sector	CO2 emission amount from energy consumption in the industrial sector per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Energy Consumption in the Household Sector	CO2 emission amount from energy consumption in the household sector per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Energy Consumption in the Commercial Service Sector	CO2 emission amount from energy consumption in the commercial service sector per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Energy Consumption in the Transportation Sector	CO2 emission amount from energy consumption in the transportation sector per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Non-energy Sources	CO2 emission amount from non-energy sources per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report”
	CO2 Emission Amount Per Unit of Power Generation	CO2 emission amount relative to power generation performance by prefecture	Electricity survey statistics Ministry of the Environment “Greenhouse Gas Emission Calculation, Reporting and Publication System” — Materials announcing the results of the survey by prefecture

g. Local Community

For local communities, there are three theme examples. The selection indicators of the second layer of outcome for each of the theme examples are as follows: For the local community field, recommended indicators have not been set.

◆ Indicators for the second layer of outcome regarding local community formation

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Neighborhood association activities	Number of events held by the neighborhood association	Neighborhood association report
		Fostering a sense of belonging	Attachment to the town where they live (e.g. whether they feel it is their hometown)	Municipal questionnaire surveys, web questionnaire surveys, etc.

Type		Indicator	Definition	Calculation Method
	Economy	Poverty rate	Percentage of household members below the poverty line	Calculating the poverty line for the municipality in accordance with the definition of the poverty line in the Comprehensive Survey of Living Conditions, and the relative poverty rate as the percentage of household members below the poverty line
	Environment	CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span

◆ **Indicators for the second layer of outcome regarding local self-government**

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Neighborhood association activities	Number of events held by the neighborhood association	Neighborhood association report
		Number of authorized groups with local ties	Number of authorized groups with local ties	Number of groups with local ties, authorized by the municipality
	Economy	Poverty rate	Percentage of household members below the poverty line	Calculating the poverty line for the municipality in accordance with the definition of the poverty line in the Comprehensive Survey of Living Conditions, and the relative poverty rate as the percentage of household members below the poverty line

◆ **Indicators for the second layer of outcome regarding regional activities**

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Volunteer activity	Number of volunteer activities in the region	Neighborhood association report, number of articles in ward newsletters, etc.
		Changes in the number of laborers	Labor (Unit: Person)	System of Social and Demographic Statistics

The following are the recommended indicators for the third layer of outcome, which is closely related to the local community field:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the local community field**

Indicator		Definition	Reference Statistics
Society			
	Fluctuation in Population	Rate of increase/decrease in population	Estimated population
	Trend in Life Span	Average life span	Ministry of Health, Labour and Welfare "Life Tables"
	Geographically-Related Connections	Neighborhood association/town council membership proportion (percentage)	Released on the website of each prefecture and municipality
Economy			
	Labor Force	Number of employed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
	Potential Labor	Number of unemployed people as a	System of Social and Demographic

	Force	percentage relative to the population aged 15 and over	Statistics Reference: Labor force survey
	Household Income	Median household income	System of Social and Demographic Statistics Reference: Labor force survey
	Gender Gap in Employment Rates	Ratio (percentage) of female workers relative to male workers	System of Social and Demographic Statistics Reference: Labor force survey
	Employment Gap by Nationality	Gap between the percentage of foreign and Japanese workers aged 15 and over (with the percentage of Japanese workers as the denominator)	Basic Complete Tabulation on Labour Force, etc. from the national census
	Disposable Income Gap	Gini coefficient of disposable income of working households	Family Income and Expenditure Survey
	Corporate Bankruptcy	Number (percentage) of bankrupt companies as a proportion relative to all companies	Tokyo Shoko Research, Ltd., “Nationwide Corporate Bankruptcy Situation” Also accessible via the statistics dashboard Number of companies by prefecture in the Basic Survey of Corporate Activities
	Industrial Strength in the Region	Gross regional product per capita	Municipal residents economic calculation
Environment			
	Greening Rate	Greening Rate	Publicly released data from municipalities
	Forests and Woodland Area	Forest area and woodland area (10,000 ha units)	Agriculture and forestry census (Ministry of Agriculture, Forestry and Fisheries) *Organized in the statistics dashboard of the Ministry of Internal Affairs and Communications.

h. Education/ Culture

For education and culture, there are three theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding education

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Number of educational menus	Increase in the number of on-demand educational menus (tailored to the target of the initiative)	Specifying websites (etc.) for on-demand educational menus and counting the number of menus
		Provision of educational opportunities regardless of factors such as age	Number of online course participants by age group, gender, and nationality (Only contents implemented as an initiative)	Specifying websites (etc.) for on-demand educational menus, followed by their administrators’ counting the number of menus
	Economy	Number of re-employed people	Number of re-employed people by age group, gender, and nationality, compared to the working population	Ministry of Health, Labour and Welfare “Labor Market Analysis Report”
		Educational expense	Educational expense per person by age group, gender, and nationality	Survey of children learning expenses
	Environment	Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

◆ Indicators for the second layer of outcome regarding child-rearing

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Number of children in the region	Population of those aged 15 and under	Estimated population
Selection Indicator	Society	Number of child-rearing-related events	Number of child-rearing-related events organized by other entities	Neighborhood association report, number of articles in ward newsletters, etc.
		Child mortality rate	Mortality rate for those aged 15 and under	Mortality rate for those aged 15 and under / number of people aged 15 and under
		Average number of births	Average number of children born to a couple over their lifetime * Average number of children for couples who have been married for 15 to 19 years	National Institute of Population and Social Security Research “Japanese National Fertility Survey (National Survey on Marriage and Childbirth)”
		Ideal number of children	Ideal number of children by gender, age group, and employment status	National Institute of Population and Social Security Research “Japanese National Fertility Survey (National Survey on Marriage and Childbirth)”
		Number of marriages	Number of marriages (crude)	Information held by the municipality
		Number of divorces	Number of divorces (crude)	Information held by the municipality
	Economy	Medical expenses	Amount of medical expenses borne per child	Information held by the municipality
		Changes in maternal and child health care expenses	Amount spent on maternal and child health care per year	Information held by the municipality
	Environment	Reduction of the amount of paper use	Amount of paper to be used for one application x number of online applications	Information held by the municipality
		Electricity charges	Electricity charges for the relevant facility compared to the previous year	Information known to the manager of the relevant facility
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

◆ **Indicators for the second layer of outcome regarding culture and art**

Type		Indicator	Definition	Calculation Method
Selection Indicator	Society	Number of artistic activities	Number of events and solo exhibitions held by local artists	Neighborhood association report, number of articles in ward newsletters, etc.
		Changes in the number of artists	Changes in the number of artists in the region	Number of people who answered that they were in one of the following categories in the occupation section of the national census: writer, sculptor/painter/craft artist, designer, photographer/videographer, musician, dancer/actor/director/performer.
	Environment	Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

The following are the recommended indicators for the third layer of outcome, which is closely related to the education and culture fields:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the education and culture fields**

Indicator		Definition	Reference Statistics
Society			
	Rate of Young People Going on to Higher Education	Rate of students going on to junior high school in the region	National census Information held by each board of education
	Bachelor Degree Holder Rate	Population with a bachelor's degree or higher (percentage relative to the population aged 25 and over)	National census
	Extent of Childcare Services	Number of children on waiting lists as a percentage relative to the total number of children under elementary school age	Information held by the department that oversees its municipality's childcare facilities
	Local Cultural Heritage	Number of national treasures and important cultural properties (buildings), number of Japan Heritage sites	Agency for Cultural Affairs Website Information retained by each municipality
Economy			
	Labor Force	Number of employed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
	Potential Labor Force	Number of unemployed people as a percentage relative to the population aged 15 and over	System of Social and Demographic Statistics Reference: Labor force survey
	Household Income	Median household income	System of Social and Demographic Statistics Reference: Labor force survey
	Gender Gap in Employment Rates	Ratio (percentage) of female workers relative to male workers	System of Social and Demographic Statistics Reference: Labor force survey
	Employment Gap by Nationality	Gap between the percentage of foreign and Japanese workers aged 15 and over (with the percentage of Japanese workers as the denominator)	Basic Complete Tabulation on Labour Force, etc. from the national census
	Disposable Income Gap	Gini coefficient of disposable income of working households	Family Income and Expenditure Survey
	Corporate Bankruptcy	Number (percentage) of bankrupt companies as a proportion relative to all companies	Tokyo Shoko Research, Ltd., “Nationwide Corporate Bankruptcy Situation” Also accessible via the statistics dashboard Number of companies by prefecture in the Basic Survey of Corporate Activities
	Industrial Strength in the Region	Gross regional product per capita	Municipal residents economic calculation

i. Government administration

For government administration, there are two theme examples. The recommended and selection indicators of the second layer of outcome for each of the theme examples are as follows:

◆ Indicators for the second layer of outcome regarding e-service

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Number of procedures	Number of procedures completed online	Information held by the municipality
Selection Indicator	Society	Improvement in the convenience of procedures (Waiting time)	Average waiting time per person for in-person applications	Information held by the municipality
		Improvement in the convenience of procedures (Number of people waiting)	Changes in the number of people waiting to apply in person (compared to the previous year and previous month)	Information held by the municipality
	Economy	Reduction of labor costs	Difference between labor and outsourcing costs reduced by going online and labor and outsourcing costs increased by going online	Information held by the municipality
	Environment	Reduction of the amount of paper use	Amount of paper to be used for one application x number of online applications	Information held by the municipality
		Electricity charges	Electricity charges for the relevant facility compared to the previous year	Information known to the manager of the relevant facility
		Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment “Municipal Emission Report” * Same indicator as the recommended indicator for the third layer, but measured over a shorter span
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

◆ Indicators for the second layer of outcome regarding digital management

Type		Indicator	Definition	Calculation Method
Recommended Indicator	Society	Number of people visiting the counters	Number of people visiting the general information desk (compared to the previous year and previous month) Changes in the number of people visiting the counters that support chatbots, etc. (compared to the previous year and previous month)	Information held by the municipality
Selection Indicator	Society	Improvement in the convenience of procedures (Waiting time)	Average waiting time per person for in-person applications	Information held by the municipality
		Improvement in the convenience of procedures (Number of	Changes in the number of people waiting to apply in person (compared to the previous year and previous	Information held by the municipality

Type		Indicator	Definition	Calculation Method
		people waiting)	month)	
	Economy	Reduction of labor costs	Difference between labor and outsourcing costs reduced by going online and labor and outsourcing costs increased by going online	Information held by the municipality
	Environment	Car usage rate	Rate of car use by residents when going out	Municipal questionnaire surveys, web questionnaire surveys, etc.
		CO2 Emission Amount From Energy Sources	CO2 emission amount from energy sources per resident	Ministry of the Environment "Municipal Emission Report" * Same indicator as the recommended indicator for the third layer, but measured over a shorter span
		Public transportation usage rate	Share ratio of public transportation * Calculated by compiling the railway share ratio and bus share ratio	Person trip survey

The following are the recommended indicators for the third layer of outcome, which is closely related to the government administration fields:

◆ **Recommended indicators for the third layer of outcome, which is closely related to the government administration field**

Indicator		Definition	Reference Statistics
Society			
	Government Administration Integrity	Voting rate	Announced by the Ministry of Internal Affairs and Communications for each election
	Geographically-Related Connections	Neighborhood association/town council membership proportion (percentage)	Released on the website of each prefecture and municipality
Economy			
	Financial Base (Local Tax Revenue)	Local tax revenue	Ministry of Internal Affairs and Communications "Municipal Settlement Status Survey"
	Financial Base (Balance of Local Government Bonds)	Balance of local government bonds	Ministry of Internal Affairs and Communications "Municipal Settlement Status Survey"

4. Evaluation Indicators for the Infrastructure Field

Recommended indicators are introduced for each evaluation field in the infrastructure field. Please refer to the items regarding the evaluation fields for the initiatives for which logic models have been created, and set appropriate KPIs. There are no selection indicators for the infrastructure field. Therefore, if you think that other indicators would be preferable as KPIs, please set them as indicators unique to the region.

Broad category	Evaluation field	Initiative theme example
Infrastructure	IT Infrastructure	Data, data linkage (beyond the framework of fundamental municipalities), City OS, asset/network, accessibility
	Management Organization Framework	Promotion of cooperation between government and citizens, promotion of citizen participation, operating fund, establishment of a data governance system
	Human Resources	Human resources for leadership/management and IT/security

Regarding the recommended indicators for the third indicator of outcome in the infrastructure field, there is only one indicator, “Functioning of the service provision infrastructure of smart cities,” so it is described in all of the sections in this chapter.

a. IT Infrastructure

For IT infrastructure, there are five theme examples. The recommended indicators for each of the theme examples and for each layer of outcome are as follows:

◆ **Indicators for the outcome regarding data**

Layer	Indicator	Definition	Calculation Method
1st	Number of accesses to the open data catalog	Increase in the number of references to the open data catalog	Number of accesses to the open data catalog
	Promoting the use of information linked to Individual Number Cards	Increase in the amount of open data linked to Individual Number Cards	Amount of open data linked to Individual Number Cards
2nd	Number of service implementations and demonstration experiments using open data	Increase in the number of service implementations and demonstration experiments using open data	Number of service implementations using open data
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding data linkage (beyond the framework of basic municipalities)**

Layer	Indicator	Definition	Calculation Method
1st	Number of cooperation with the municipal data platform	Increase in data linkage	Number of data-linking fields
2nd	Number of data-linking service implementations and demonstration experiments	Increase in the number of data-linking service implementations and demonstration experiments	Number of data-linking service implementations
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding the City OS**

Layer	Indicator	Definition	Calculation Method
1st	Number of regions and number of PFs linked to the City OS	Increase in municipal cooperation and inter-PF cooperation with respect to the City OS	Number of linked regions and number of linked PFs
2nd	Number of service	Increase in the number of service	Number of service

	implementations and demonstration experiments with respect to the City OS	implementations and demonstration experiments with respect to the City OS	implementations with respect to the City OS
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding assets and networks**

Layer	Indicator	Definition	Calculation Method
1st	Response speed of each service in the system	Effective speed of high-quality networks	Average response time during business hours
2nd	Usage rate	Network satisfaction	Percentage of registered users relative to the total number of users
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding accessibility**

Layer	Indicator	Definition	Calculation Method
1st	Provision of services to a wide range of generations	Increase in service usage by year of birth	Usage rate of the relevant service by approximate year of birth
2nd	Satisfaction degree with accessibility	Improvement of accessibility/ elimination of the digital divide	Measuring reliability through a survey of residents' attitudes (%)
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Number of users (degree of penetration of smart city services); internet usage rate

b. Management organization framework

For management organization frameworks, there are four theme examples. The recommended indicators for each of the theme examples and for each layer of outcome are as follows:

◆ **Indicators for the outcome regarding the promotion of public-private-academia cooperation**

Layer	Indicator	Definition	Calculation Method
1st	Number of organizations participating in public-private-academia cooperation	Increase and maintenance of the number of organizations participating in the public-private-academia cooperation framework	Number of organizations participating in the public-private-academia cooperation framework
2nd	Number of cases of public-private-academia cooperation	Number of residents supported by the organization supporting resident participation	Number of residents supported (Cumulative)
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding the promotion of resident participation**

Layer	Indicator	Definition	Calculation Method
1st	Number of resident participation organizations	Increase in the number of organizations supporting resident participation	Number of resident participation support organizations that are linked with the municipality
2nd	Number of residents participation	Number of residents supported by the organization supporting resident participation	Number of residents supported (Cumulative)
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding operating fund**

Layer	Indicator	Definition	Calculation Method
1st	Continuity of operating funds	Recovering operating costs	Rate of increase in income (compared to the previous year)
2nd	Monetization	Decrease in the percentage of government subsidies for operating funds	Percentage of government subsidies for operating funds
3rd	Functioning of the service provision	Whether or not the environment has been	Number of users (degree of penetration of smart city

	infrastructure for smart cities	developed to enable the municipality to perform what it wants to do in a smart way	services); internet usage rate

◆ **Indicators for the outcome regarding the establishment of a data governance system**

Layer	Indicator	Definition	Calculation Method
1st	Number of incidents	Decrease in the number of incidents	Number of serious incidents such as data leaks
2nd	Reliability	Reliability improvement	Measuring reliability through a survey of residents' attitudes (%)
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

c. Human Resources

For human resources, there are two theme examples. The recommended indicators for each of the theme examples and for each layer of outcome are as follows:

◆ **Indicators for the outcome regarding human resources for leadership and management**

Layer	Indicator	Definition	Calculation Method
1st	Number of participants who have completed smart city programs	Increase in the number of participants in projects by graduates of programs listed in the Smart City Guidebook	Checking whether they are graduates of the programs listed in the Smart City Guidebook
2nd	Utilization of human resources for leadership and management	Increase in the number of smart city workers with management skills	Number of people with at least 7 years of experience in work related to smart cities
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

◆ **Indicators for the outcome regarding human resources for IT and security**

Layer	Indicator	Definition	Calculation Method
1st	Number of professionals with IT and security-related qualifications	Increase in the number of professionals with IT and security-related qualifications	Checking whether they have IT and security-related qualifications
2nd	Utilization of human resources for IT and security	Increase in the number of smart city workers with IT and security skills	Number of people with at least 7 years of experience in work related to IT and security Number of people with at least 7 years of system development or operation experience
3rd	Functioning of the service provision infrastructure for smart cities	Whether or not the environment has been developed to enable the municipality to perform what it wants to do in a smart way	Degree of penetration of smart city services (number of services that have been in operation for 3 years or more); internet usage rate

5. How to Check for Cause and Effect (Example)

Up to this point, a logic model has been created and KPIs have been set. In this section, one method for confirming the completeness of the created model[7][8] is introduced as an example.

It is important to plan data collection with the ideal measurement method in mind, but if that is difficult, it is also possible to consider a simpler method.

◆ The ideal measurement method for inferring causality (Randomized controlled trial)

The effect of policies is to be measured by comparing the changes in the indicators of the target group and the non-target group.

As shown in the table below, if we define A to D, the effect of the policy is "(B – A) – (D – C)".

Data collection target	Outcome before policy implementation	Outcome after policy implementation
Policy target group	A	B
Policy non-target group	C	D

An example of this measurement method is the causal relationship between education received by a child and how much it changes his or her life afterwards. In this experiment, people who participate in education α and those who participate in education β are randomly divided (so that the gender, ability, etc. are equal) to demonstrate. In this situation, if we consider how much difference is made by the content of the received educational program, which is the only difference, it is thought that the causal relationship can be demonstrated more accurately, with the educational program as the cause and the subsequent career as the result.

However, in reality, it is often difficult to gather all data required to put this method into practice.

◆ Simple method for measuring effects (Natural experiment, etc.)

Let's assume that there are no changes in the outcomes of policy non-target group before and after the implementation of the policy. Then measure the effect of the policy on the target group (B – A in the table above) and compare the target and non-target groups (B – C and B – D in the table above).

When a municipality introduces a new policy, it is thought that the effect of the policy can be verified by collecting data to see what kind of difference it makes from (in comparison with) an area outside the municipality (in a neighboring municipality) that is basically similar to the municipality and where the new policy has not yet been implemented.

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[7] What Is EBPM (Evidence-based Policy Making)? New Policy Formation in the Reiwa Era, Masanobu Ogura

Introduction to EBPM, Kei Nishiuchi (DataStart: Data utilization support site for local public organizations)

https://www.stat.go.jp/dstart/point/lecture/01.html

1. List of References

With the exception of the footnotes, the reference materials for this document are as follows:

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- Toru Sato (2021) "An Introduction to Evidence-based Municipal Policies: How To Create and Utilize Logic Models", Koshokuken
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- Nobuo Akai (2019) "Local Government Fiscal Soundness Act and the Economics of Governance: An Empirical Evaluation 10 Years after the Full-Scale Implementation of the System", Yuhikaku Publishing
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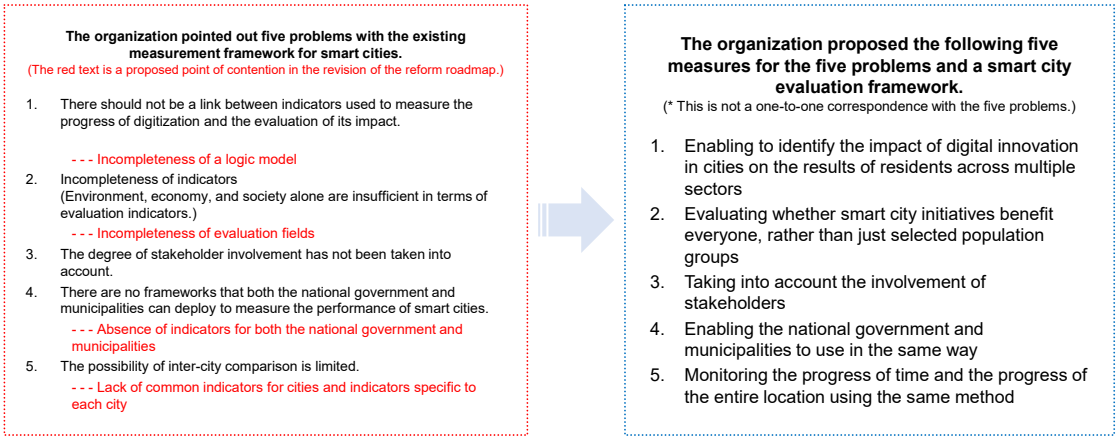
  https://www.stat.go.jp/dstart/point/lecture/01.html
- Nippon Institute for Research Advancement (2019) "Does Scientific Analysis Improve the Quality of Policy?" My Vision No. 45
  https://www.nira.or.jp/paper/my-vision/2019/post-12.html
- CREPECL-4: What Is Evidence? — What is Required to Promote EBPM, Shintaro Yamaguchi (Center for Research and Education on Policy Evaluation, University of Tokyo)
  http://www.crepe.e.u-tokyo.ac.jp/material/crepecl4.html

2. Previous Cases Related to the Evaluation of SCs (Smart Cities) and Cities in Japan and Overseas

The results of the previous cases of evaluation of SCs (smart cities) and cities in Japan and overseas investigated in 2021 are as follows.

◆ OECD: MEASURING SMART CITIES' PERFORMANCE (2020)



The organization that has developed the framework is the Organization for Economic Cooperation and Development (OECD). One of the characteristics of the evaluation indicators is that, based on the classification of the world's major smart city evaluation indicators (ISO, ITU-T, CITYKeys, etc.) and the review of the contents of the individual indicators, it has been pointed out that there is a mixture of input, output and outcome indicators, and after redefining these, the organization is proposing a three-layered structure of indicators.

The details of the indicators are as shown in the following figure (Smart City Measurement Framework). The organization divides the evaluation indicators into three pillars: 1st pillar (evaluating for each technology field that makes up a smart city as a "smart city tool"), 2nd pillar (evaluating the involvement of all parties concerned as "stakeholders"), and 3rd pillar (evaluating the final outcome of a smart city as "smart city performance").

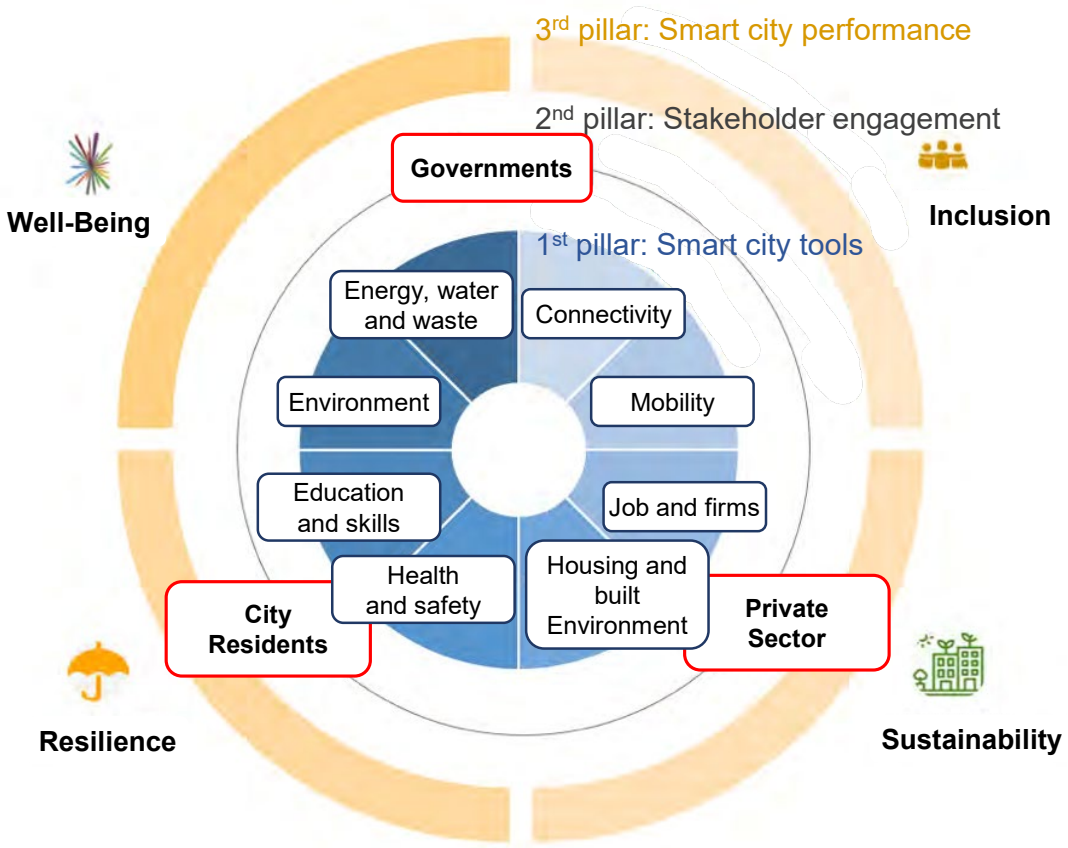


Diagram OECD Smart City Measurement Framework (Source: OECD)

According to the latest OECD report[9], in order to further develop the smart city measurement framework for 2020, the following four points will be focused on in the future.

(1) Determining the range of a specific indicator for each pillar
(2) Identifying the optimal and appropriate scale of analysis (e.g. municipalities, functional urban areas)
(3) Identifying data sources through potential new surveys and other tools
(4) Collecting and distributing data so that cities, municipalities and the national government can track and compare performance

[9] Measuring smart city performance in COVID-19 times (2021)

◆ **LEED[10] for Cities and Communities v4.1** (2020 *First Edition: 2017)

The organization that has developed the framework is U.S. Green Building Council (USGBC). For the indicators, certification assessment is performed by Green Business Certification Inc. (GBCI).

The indicators have been created to support local leaders in making responsible, sustainable and concrete plans in the areas of natural systems, energy, water environment, waste, transportation and other factors that contribute to quality of life.

The indicators form a framework for evaluation that covers all the key points to be considered in relation to natural ecosystems, energy, water, waste, transportation and other aspects of quality of life. These indicators can be applied to cities and communities of all forms, sizes and development stages, and can be applied to both development entities (public and private) and development types (new development and mature existing cities), and as of March 1, 2021, they have been certified in 120 cities and communities.

There are four certification programs to select from, depending on the combination of the development stage (planning stage, construction completion stage) and the extent of the target (administrative unit = cities, non-administrative unit = communities). The certification is divided into four levels based on the number of points earned for the indicators set for each category: 40-49 points for “Certified”; 50-59 points for “Silver”; 60-79 points for “Gold”; and 80 points or more for “Platinum”. The following are some of the evaluation items[11]:

	Category		Indicator
1	**Energy**		• CO2 emissions amount (tons / person per year)
2	**Water**		• Household water consumption (Annual cost per person)
3	**Waste**		• Solid waste within the city (Annual cost per person) • Solid waste from landfill within the city (Percentage relative to the total cost of waste collected)
4	**Transportation**		• Distance traveled by private cars per day (distance/person per day)
5	**QoL (Quality of life)**	**Education**	• Population with a high school diploma or higher (percentage relative to the population aged 25 and over) • Population with a bachelor's degree or higher (percentage relative to the population aged 25 and over)
6		**Equitability**	• Median (percentage) of total rent as a proportion of household income • Gini coefficient
7		**Prosperity**	• Median household income (US dollars / year) • Unemployment rate (of the population aged 16 and over)
8		**Health & safety**	• Median air quality index • Number of days with poor air quality for sensitive groups (days/year) • Violent crime (Number of cases/person per year)

[10] Abbreviation for Leadership in Energy and Environmental Design
[11] Table 1. Evaluation items in LEED for Cities and Communities

USGBC provides six different indicators, and this indicator is number (6).

(1) BD+C (Building design and construction)

(2) ID+C (Interior design and construction)

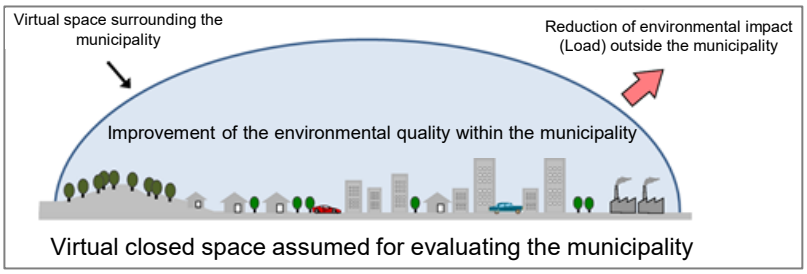
(3) O+M (Operation and maintenance of existing buildings)

(4) ND (Neighborhood development)

(5) HOMES (Home)

(6) Cities and Communities (Cities and communities)

◆ **CASBEE**[12] **— City** (2013 *First Edition: 2011)



The organization that has developed the framework is the Japan Sustainable Building Consortium (JSBC), and the figure above[13] is a proposal for the concept of a virtual enclosed space in a city.

The indicators have been created for use by municipalities as a means of evaluating cities from two perspectives: the “environmental quality and activity level (Q: Quality)” of a city and the “environmental impact (L: Load)” that a city has on the outside world. The indicators are designed to help many people involved in the city share a common awareness and work towards a desirable “vision of the city of tomorrow”.

Specifically, a hypothetical border area is established around the target city (municipality) and the following are measured to evaluate cities with high BEE as excellent cities.

Q (Quality): Internal environmental quality and activity level

L[14] (Load): Environmental impact on the outside world

BEE (Built Environment Efficiency) = Q/L – Environmental efficiency

By performing similar work that is ranked into S, A, B+, B-, and C based on BEE values, with future prediction (no measures) and future goals (with measures), it is possible to examine the possibility of future improvement. The evaluation items for Q and L are as shown in the following table.

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[12] Abbreviation for Comprehensive Assessment System for Built Environment Efficiency

[13] CASBEE — Concept of a Virtual Enclosed Space in a City (Source: CASBEE — City 2013)

In industrial areas where uniform evaluation would result in unfavorable figures, a reallocation type of L is provided to distinguish between the evaluation of the location of industrial activity and the evaluation of the location of final demand.

As of December 2015, they were used to grasp the current situation of all 1,750 municipalities and to evaluate the policies of future cities in the Cabinet Office environmental future city concept.

	Large category	Intermediate category	Small category
Evaluation item for Q	Q1 Environment	Q1.1 Environmental conservation	Q1.1.1 Natural land ratio
		Q1.2 Environmental quality	Q1.2.1 Atmospheric quality Q1.2.2 Water quality
		Q1.3 Resource circulation	Q1.3.1 Recycling rate for general waste
		Q1.4 Measures to absorb CO2	Q1.4.1 Measures to increase CO2 absorption by forests
	Q2 Society	Q2.1 Living environment	Q2.1.1 Housing level of satisfaction Q2.1.2 Traffic safety Q2.1.3 Crime prevention Q2.1.4 Disaster response level
		Q2.2 Social services	Q2.2.1 Extent of educational services Q2.2.2 Extent of cultural services Q2.2.3 Extent of medical services Q2.2.4 Extent of childcare services Q2.2.5 Extent of services for elderly people
		Q2.3 Social vitality	Q2.3.1 Population growth rate Q2.3.2 Healthy life expectancy
	Q3 Economy	Q3.1 Industrial power	Q3.1.1 GRP equivalent amount per person Q3.1.2 Labor force
		Q3.2 Financial base strength	Q3.2.1 Local tax revenue Q3.2.2 Local debt balance
		Q3.3 CO2 trading power	Q3.3.1 Support for reducing CO2 emission in other regions
Evaluation item for L	L1 CO2 emission amount from energy sources	L1.1 Industrial sector	* Redistribution-type target item
		L1.2 Livelihood family sector	
		L1.3 Livelihood business sector	
		L1.4 Transportation sector	
	L2 CO2 emission amount from non-energy sources	L2.1 Waste management, etc.	

◆ **BREEAM[15] Communities** (2017 *First Edition: 2012)

The organization that has developed the framework is BRE Global Ltd.[16] The framework is a set of indicators that improve, measure and certify the social, environmental and economic sustainability of master plans for medium to large-scale developments, including new community development and community regeneration, by integrating sustainable design into the master planning process. The main users are expected to be developers, master plan specialists, municipalities, local politicians, communities, and related statutory organizations.

Regarding the structure of the indicators, in addition to the five core indicators (see the

[15] Abbreviation for Building Research Establishment Environmental Assessment Method
[16] This is a certification-related department within the BRE Group and is an accreditation body certified by the UK Accreditation Service (UKAS).

table below), Innovation has been set as the sixth indicator. So that projects in most parts of the world can be evaluated, optional criteria are also provided that reflect the environment, politics, economy, culture and climate of individual regions.

	Category		Weight	Indicator
1	**Governance**		9.3%	Consultation planning; consultation and involvement; design review; facility community management
2	**Social and economic wellbeing**	**Local economy**	14.8%	Economic impact; training and skills
		Social wellbeing	17.1%	Demographic needs and priorities; housing supply; provision of services, facilities, and amenities; public realm; utilities; green infrastructure; local parking; local vernacular; inclusive design
		Environmental conditions	10.8%	Flood risk evaluation; noise pollution; microclimate; response to climate change; flood risk management; light pollution
3	**Resource and energy**		21.6%	Energy strategy; existing buildings and infrastructure; water strategy; sustainable buildings; low-impact (on the environment) materials; carbon emission from the transportation sector
4	**Land use and ecology**		12.6%	Ecology strategy; land use; water pollution; improvement of ecological values; landscape; rainwater storage
5	**Transport and movement**		13.8%	Transportation evaluation; safe and attractive streets; bicycle network; access to public transportation; facilities for bicycles; public transportation

The feature of these indicators is that scoring and rating are to be performed with the following five items in mind:

(1) Besides individual performance evaluations of the required standards, balance score evaluation is performed.
(2) When designing using both individual issues and BREEAM credits, care is required since the flexibility of projects will decrease.
(3) Innovation credits can be added for innovative technologies, systems, and processes beyond standard issues.
(4) Setting weighting for the evaluation of each category (Also setting weighting for each item within the category)
(5) Evaluation on a scale of 6 (Outstanding, Excellent, Very Good, Good, Unclassified) based on the final score; comparison with other communities is possible.

As of 2018, more than 20 projects had been certified, and more than 35 communities were being evaluated/registered. BRE Global currently offers five types, and this indicator corresponds to (1).

(1) Communities
(2) Infrastructure
(3) New Construction
(4) In-Use
(5) Refurbishment & Fit-Out

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