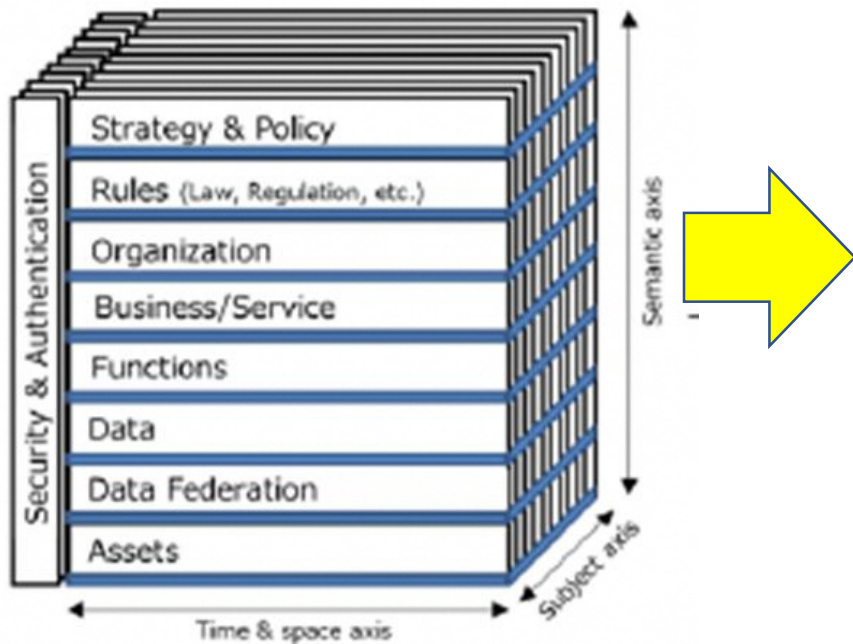# Society 5.0

- Convergence between cyber and physical spaces
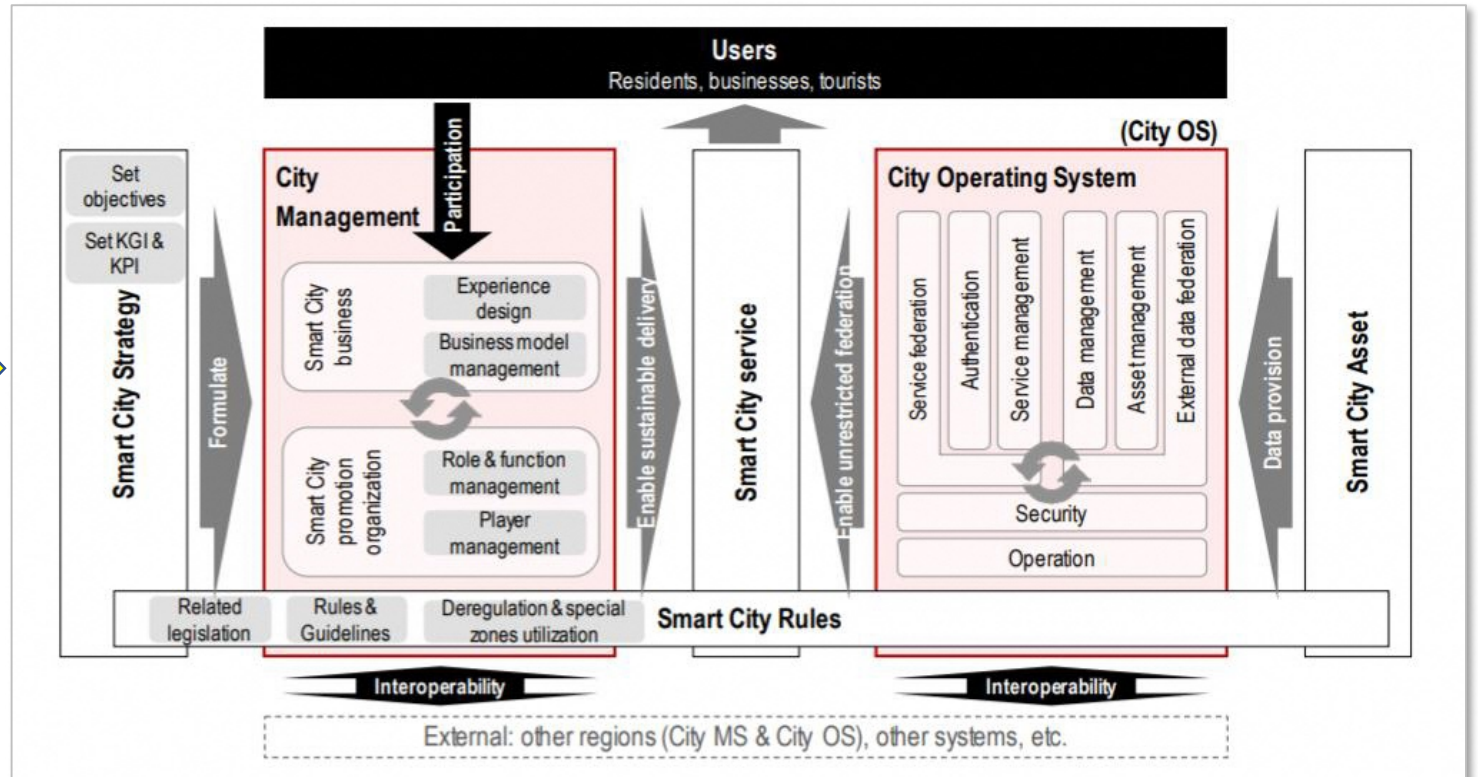- Resolving economic and social problems
- Human-Centricity
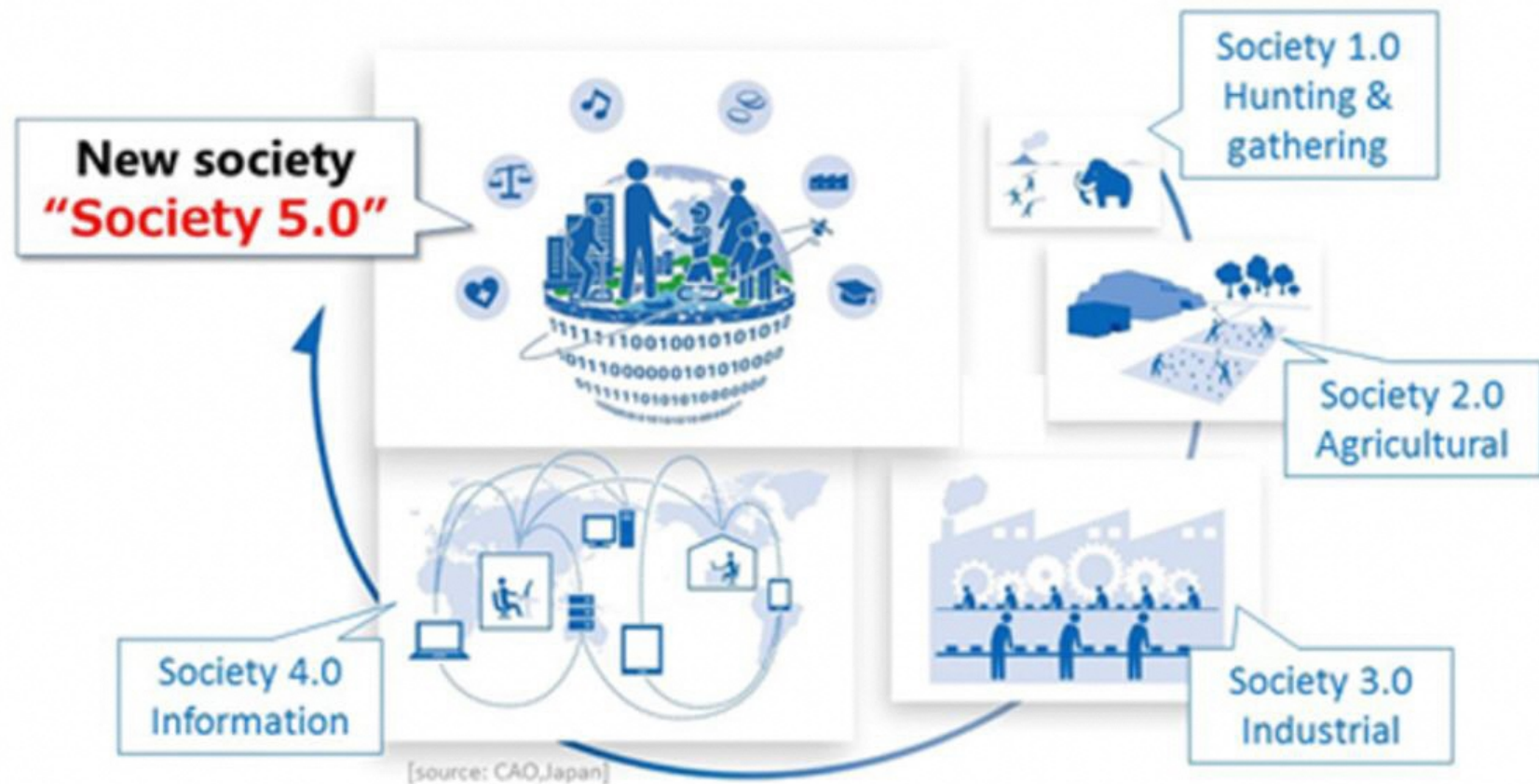
Smart City Reference Architecture
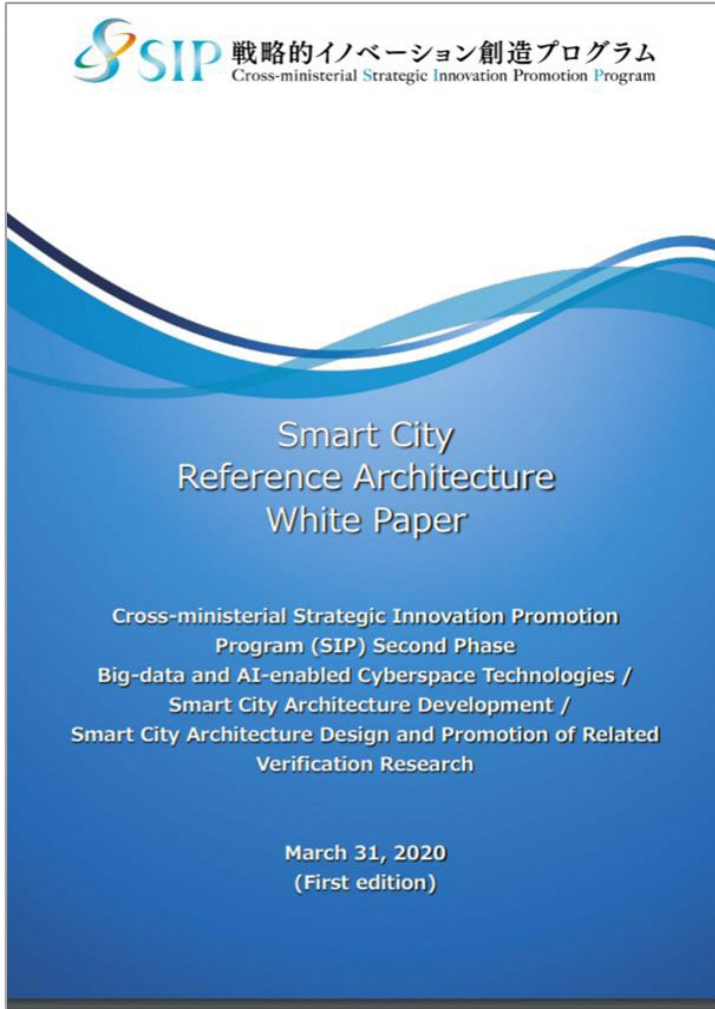
Society 5.0 Architecture

Smart City Reference Architecture
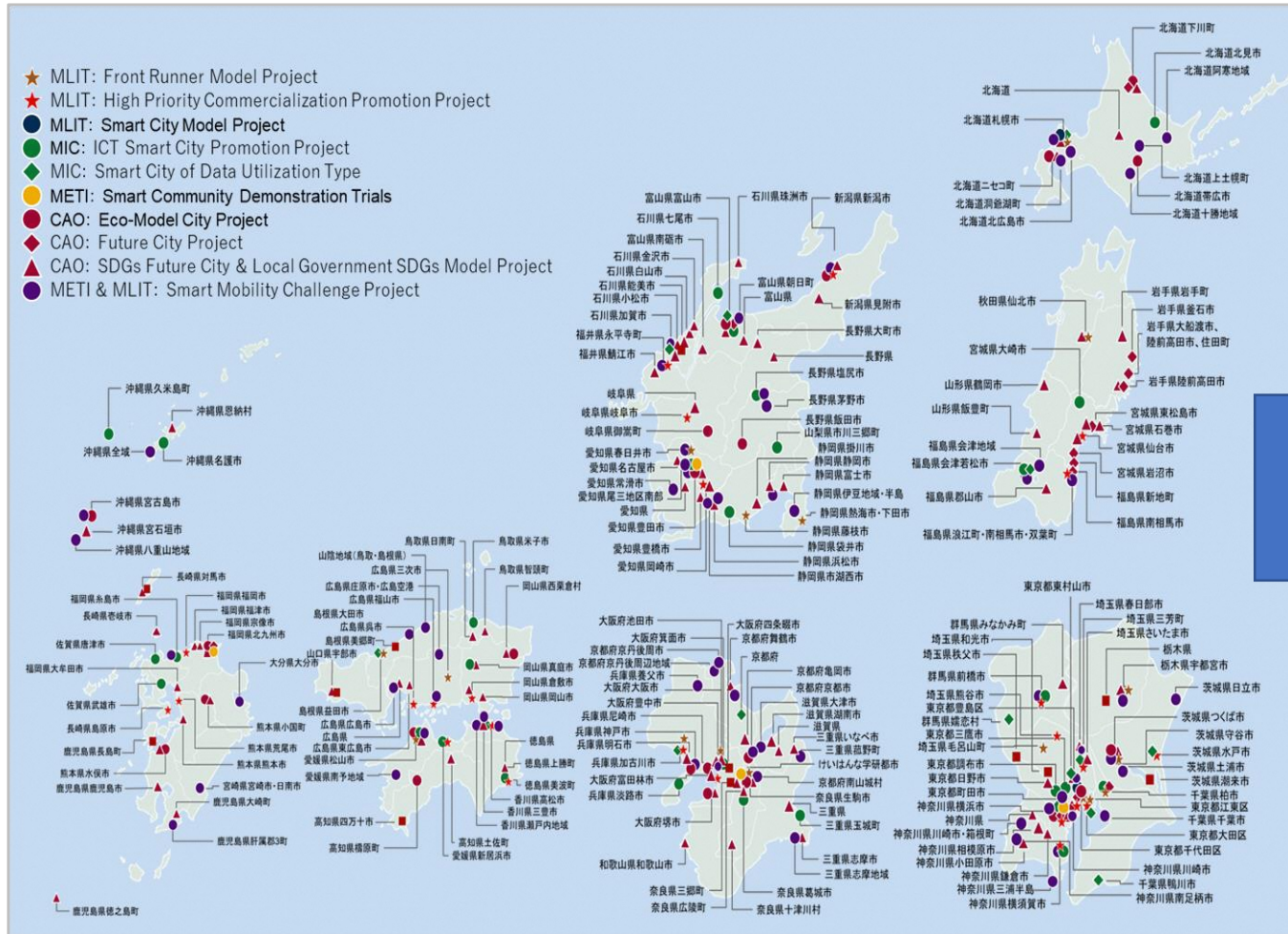
Smart City Reference Architecture

Smart City strategy		• Set objectives	Set objectives to be achieved by Smart City based on issues and strategies of the region	Chapter 3
		• Set KGI/KPI	Set quantitative indexes to measure the effectiveness of Smart City initiatives against each objective	
Smart City rules		• Comply with related legislations (laws and regulations)	Understand related legislations and prepare how to comply	Chapter 4
		• Set rules/guidelines in each region	Understand and formulate rules and guidelines needed for the region	
		• Deregulation/Special zones utilization	Understand and utilize the systems available to maximize effectiveness of the initiatives	
City management	Smart City promotion organization	• Role/function management	Extract functions and roles required for the sustained promotion and operation of the region, and manage the model	Chapter 5
		• Player/stakeholder management	Select players for the roles and functions constructed, and manage stakeholders	
	Smart City business	• Business model management	Construct and operate the economic activities model amongst the players with the objective of the sustained operation of the region	
		• Experience design	Provide regional operations and initiatives involving the residents to enable consistent resident-centric experiences	
Smart City service (defined locally)		-	Initiatives in digital form such as applications, etc., managed on City OS and delivered to users	Chapter 6
City Operating System (City OS)	Function (service)	• Service federation	Provide functions and API to federation various services operating on City OS	Chapter 7
		• Authentication	Provide authentication method appropriate for the use case to users, services, and other City OSs	
		• Service management	Manage services which link to City OS, and provide the optimum combination of functions appropriate for the service	
	Data	• Data management	Broker the data shared across multiple regions and other systems, and manage the data stored and accumulated on City OS	
	Data federation	• Asset management	Manage registration/deletion/etc. of the asset (devices and other systems) connected to City OS, and execute control over the assets	
		• External data federation	Manage interfaces with assets, other systems, or other City OSs, and absorb differences in data formats and protocols	
	Common function	• Security	Provide functions required to protect City OS against threats within and outside City OS	
		• Operation	Provide such functions as monitoring, backup, troubleshooting, required for the IT systems operation of City OS	
Smart City asset (defined locally)		-	Assets which are capable of generating digital data to be collected by City OS	Chapter 8

# Going Beyond Silo – "PPPP" to Overcome Fragmentation

Government-Funded Smart City Proof of Concept Projects

★ MLIT: Front Runner Model Project
★ MLIT: High Priority Commercialization Promotion Project
● MLIT: Smart City Model Project
● MIC: ICT Smart City Promotion Project
◆ MIC: Smart City of Data Utilization Type
● METI: Smart Community Demonstration Trials
● CAO: Eco-Model City Project
◆ CAO: Future City Project
▲ CAO: SDGs Future City & Local Government SDGs Model Project
● METI & MLIT: Smart Mobility Challenge Project

Smart City Public-Private Partnership Platform

- In the "Integrated Innovation Strategy 2019", etc., which was approved by the Cabinet on June 21, 1991, it was stipulated that a public-private partnership platform would be built to promote the smart city business.
- The Cabinet Office, Ministry of Internal Affairs and Communications, Ministry of Economy, Trade and Industry, and Ministry of Land, Infrastructure, Transport and Tourism have "smart city public-private partnerships" with companies, universities / research institutes, local public organizations, related ministries, etc. as members in order to accelerate smart city initiatives through public-private partnerships. Established "Collaboration Platform".
- As member support, (1) business support, (2) subcommittees, (3) matching support, and (4) dissemination promotion activities are implemented.

Configuration of smart city public-private partnership platform

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4
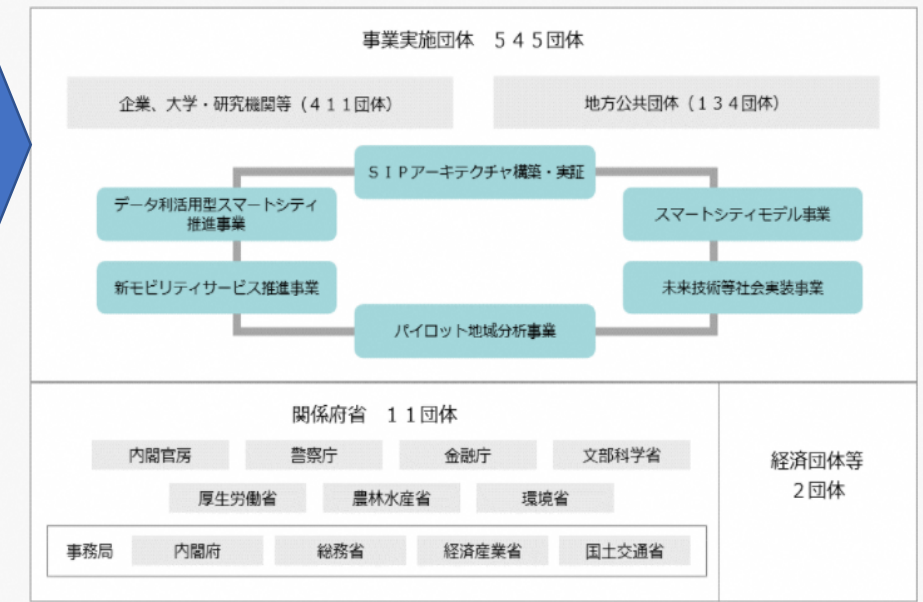
Emergence of Smart City Architect as Cornerstone Position

■ System thinking that seeks a holistic view and relationships between disciplines

Smart City Goals and Objectives for Citizens

Architect

Urban Design
System Engineering
Data Science
Public Policy
Business Promotion
Community Design
Civic Tech
Communication
Laws and Regulations ...

Architect

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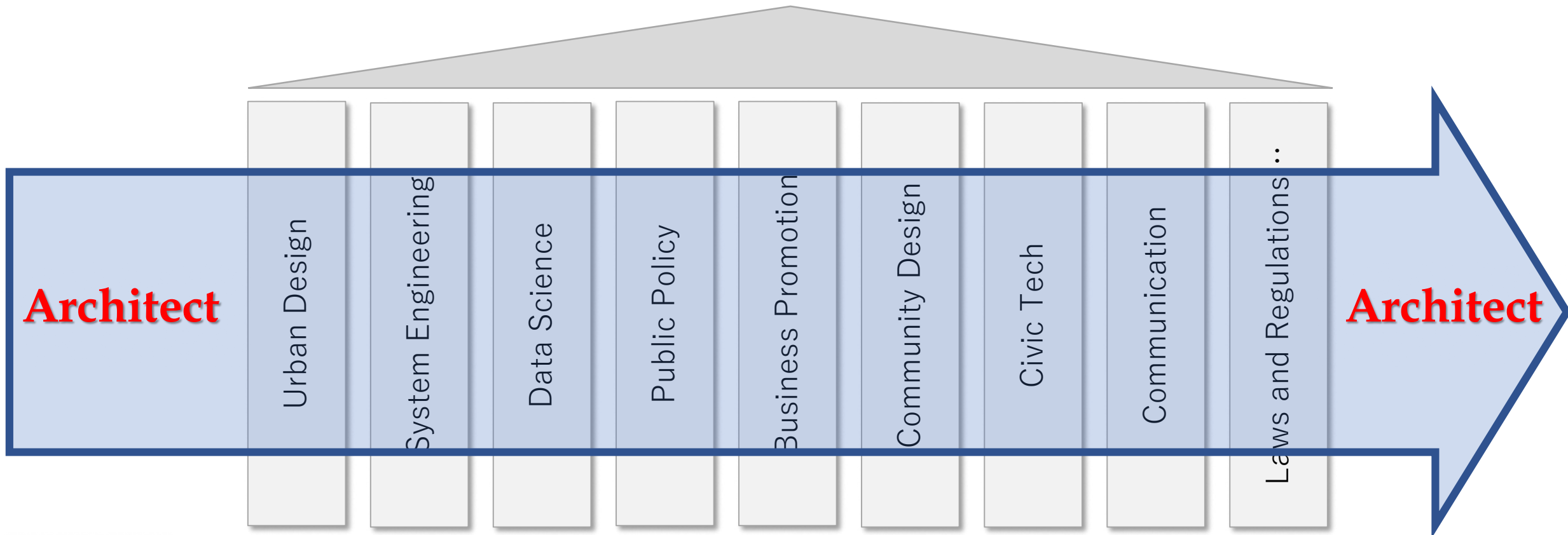
City Operating System (OS) - Data Linkage Platform

■ Super City is a city where we aim to improve welfare and convenience by providing various services to residents, etc., centering on the "Data Linkage Platform" (City-OS) that collects, organizes and provides various data across fields.

Structure of Super City
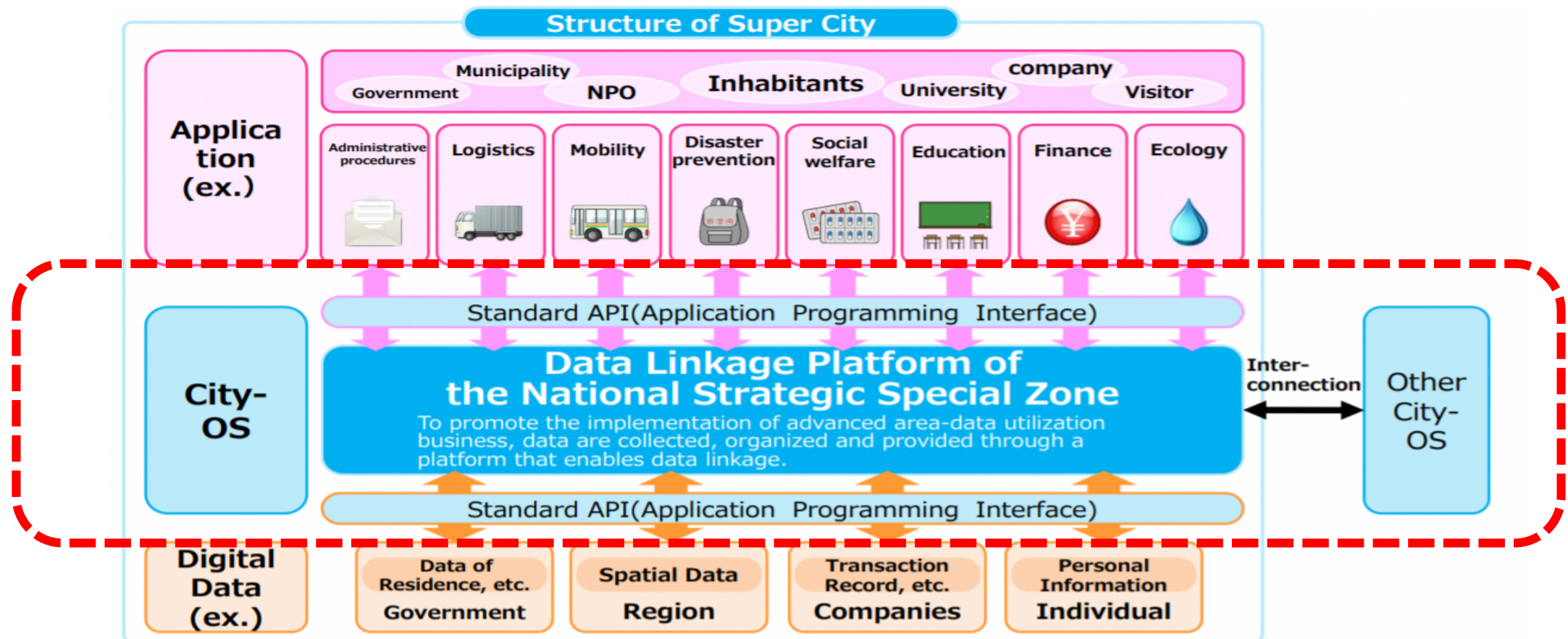
"Super City Open Lab" to Promote Collective Action & Impact

■ 209 organizations are registered in the Super City Open Lab (as of 28 December, 2020).

Architecture
Orchestration
Service Applications
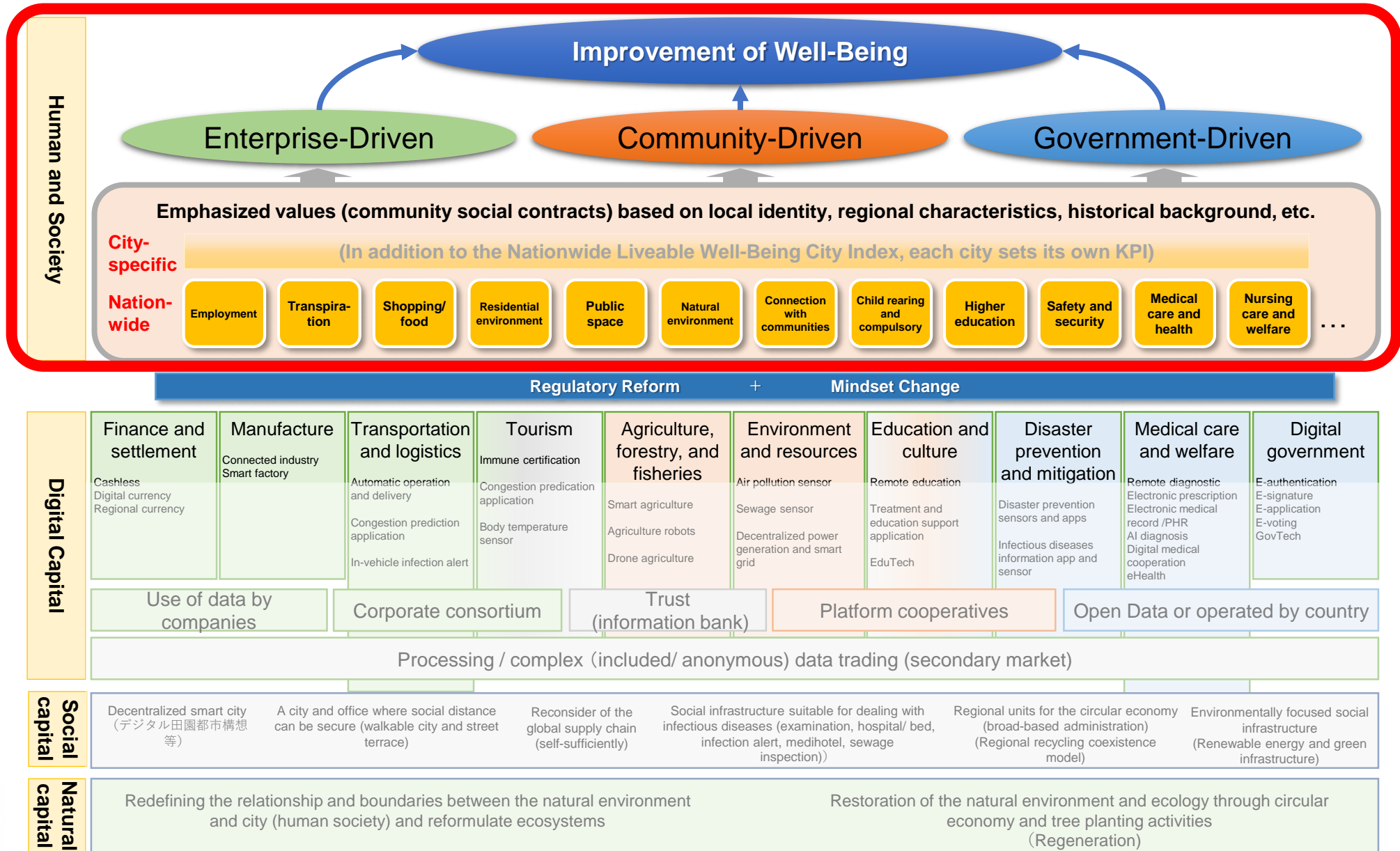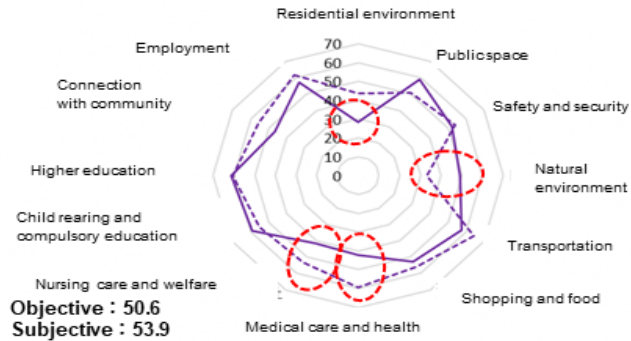City OS
Networks
Infrastructure / Sensors

https://www.kantei.go.jp/jp/singi/tiiki/kokusentoc/supercity/supercity.pdf

How Do We Improve Citizens' Well-Being through Building Smart Cities?

Improvement of Well-Being

- Enterprise-Driven
- Community-Driven
- Government-Driven

Human and Society

Emphasized values (community social contracts) based on local identity, regional characteristics, historical background, etc.

City-specific

(In addition to the Nationwide Liveable Well-Being City Index, each city sets its own KPI)

Nation-wide

| Employment | Transpira-tion | Shopping/food | Residential environment | Public space | Natural environment | Connection with communities | Child rearing and compulsory | Higher education | Safety and security | Medical care and health | Nursing care and welfare | ... |

Regulatory Reform + Mindset Change

Digital Capital

Finance and settlement	Manufacture	Transportation and logistics	Tourism	Agriculture, forestry, and fisheries	Environment and resources	Education and culture	Disaster prevention and mitigation	Medical care and welfare	Digital government
Cashless Digital currency Regional currency	Connected industry Smart factory	Automatic operation and delivery Congestion prediction application In-vehicle infection alert	Immune certification Congestion predication application Body temperature sensor	Smart agriculture Agriculture robots Drone agriculture	Air pollution sensor Sewage sensor Decentralized power generation and smart grid	Remote education Treatment and education support application EduTech	Disaster prevention sensors and apps Infectious diseases information app and sensor	Remote diagnostic Electronic prescription Electronic medical record /PHR AI diagnosis Digital medical cooperation eHealth	E-authentication E-signature E-application E-voting GovTech

| Use of data by companies | Corporate consortium | Trust (information bank) | Platform cooperatives | Open Data or operated by country |

Processing / complex（included/ anonymous) data trading (secondary market)

Social capital

| Decentralized smart city（デジタル田園都市構想等） | A city and office where social distance can be secure (walkable city and street terrace) | Reconsider of the global supply chain (self-sufficiently) | Social infrastructure suitable for dealing with infectious diseases (examination, hospital/ bed, infection alert, medihotel, sewage inspection)) | Regional units for the circular economy (broad-based administration) (Regional recycling coexistence model) | Environmentally focused social infrastructure (Renewable energy and green infrastructure) |

Natural capital

Redefining the relationship and boundaries between the natural environment and city (human society) and reformulate ecosystems

Restoration of the natural environment and ecology through circular economy and tree planting activities（Regeneration)

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Introduced RMIT's Liveability Indicators to Japanese Cities

Average Tokyo 23 wards type

Objective : 50.6
Subjective : 53.9

Schools are well-equipped, but the land price is extremely high. Low correlation between subjectively and objectively in terms of natural environment, medical care, and nursing.

Average metropolitan type

Objective : 49.8
Subjective : 54.6

The ventral city of each regional block. Good parks are existed, low correlation between subjectively and objectively in terms of employment, natural environment, mobility, and connections with communities.

Average tourist city type

Objective : 51.6
Subjective : 54.8

A group of city famous as tourist spots. Plenty parks and rich environment, low correlation between subjectively and objectively in terms of employment and connection with the communities.

Bed-town type

Objective : 50.3
Subjective : 52.7

Although land price is slightly higher, overall balance is good. On the other hand, the correlation between subjectively and objectively is slightly low in many fields especially in parks, natural environment, and employment.

Urban area leader type

Objective : 49.6
Subjective : 53.1
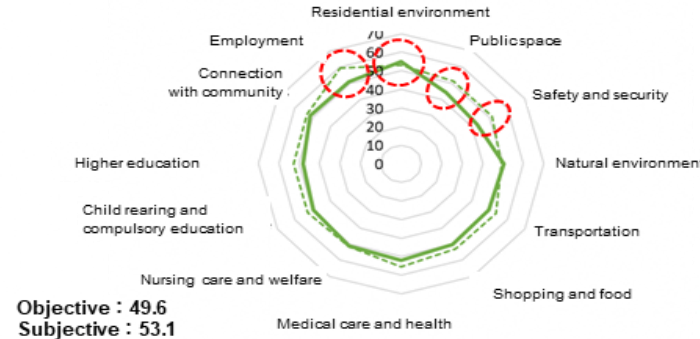
A city that build its own urban area as a leader of surrounding local governments. The land price is not high. Low correlation between subjectively and objectively in terms of park, safety, traffic accident, and employment.

R&D / Industrial city type

Objective : 50.3
Subjective : 53.6

One of the most industrialized areas in the surrounding areas or a city with research universities. Low correlation between subjectively and objectively in terms of parks, schools, medical resources.
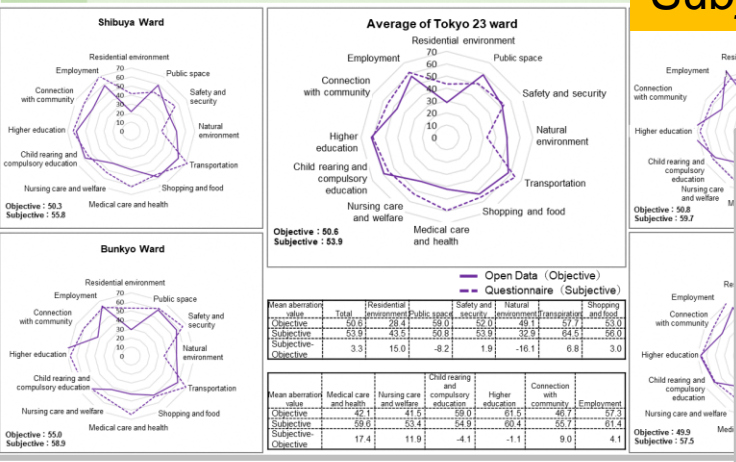
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9

6 City Types

Subjective & Objective

KPIs

Tokyo 23 Wards Type: Japanese capital with convenient and full of jobs but seemingly overcrowded

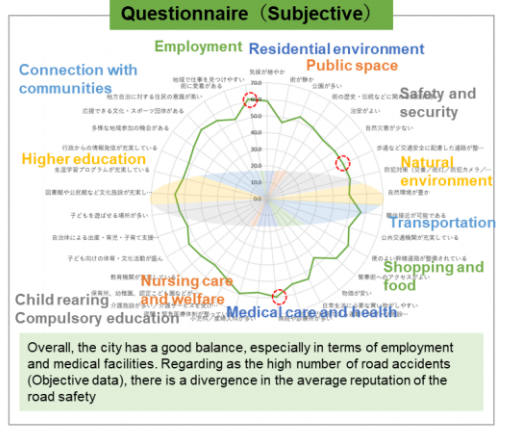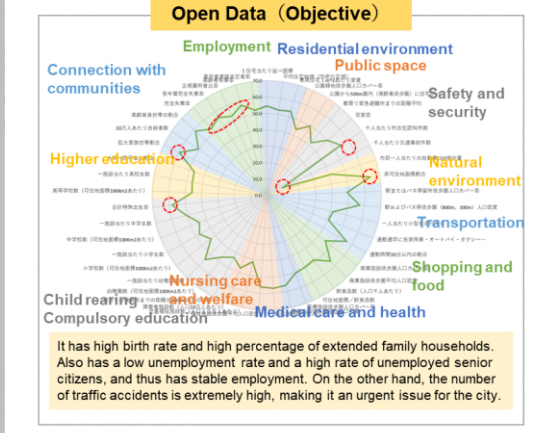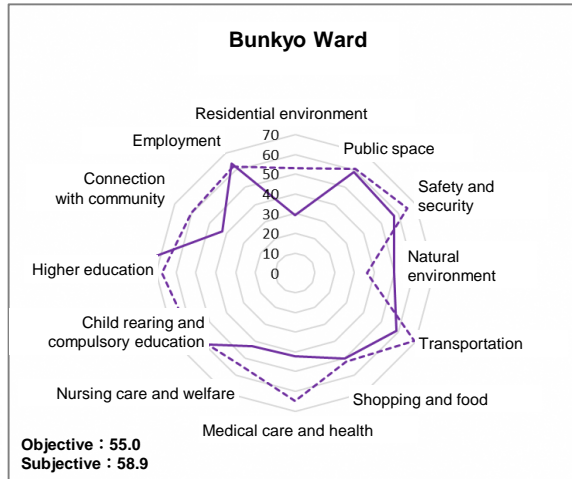|	
Objective	Tokyo 23 wards have the greatest differences between sectors. It is convenient to travel and shop, has employment opportunities, and well-equipped parks and schools. However, the land prices are high, the number of medical and welfare facilities per population is low, and the facilities are crowded.
Subjective	The subjective and objective data do not correlate in terms of the level of medical facilities and natural environment. While the city has a good level of employment and various public facilities, it has received a severe evaluation regarding its quietness and cost of living, creating an impression of an overcrowded city.

Shibuya Ward
Objective : 50.3
Subjective : 55.8

Bunkyo Ward
Objective : 55.0
Subjective : 58.9

Average of Tokyo 23 ward
Objective : 50.6
Subjective : 53.9
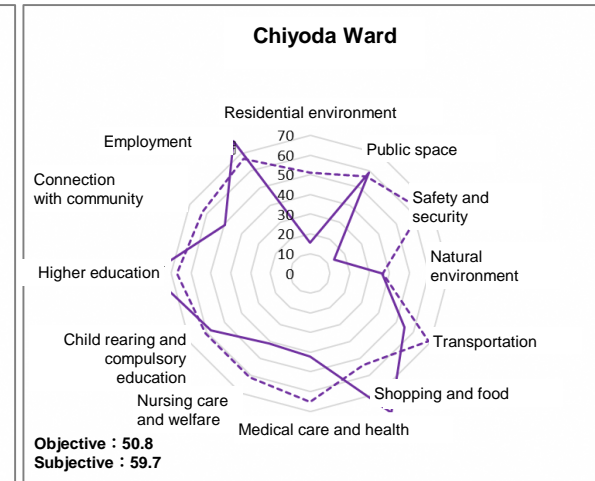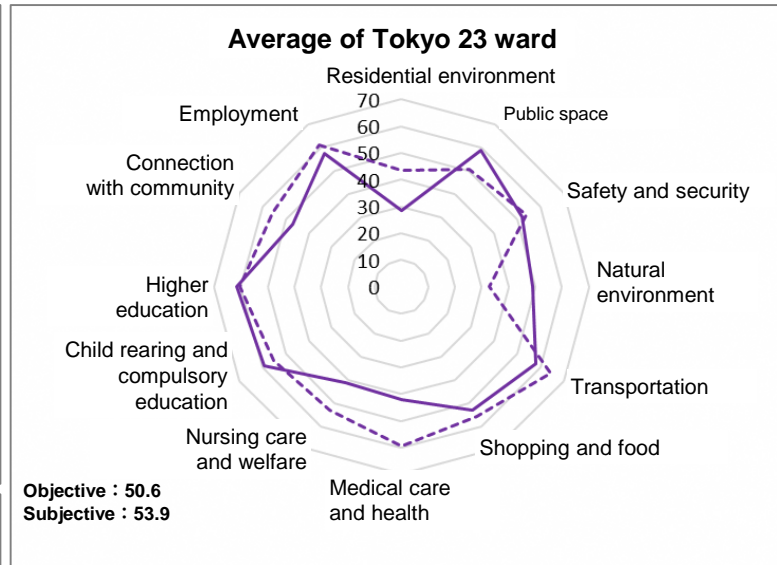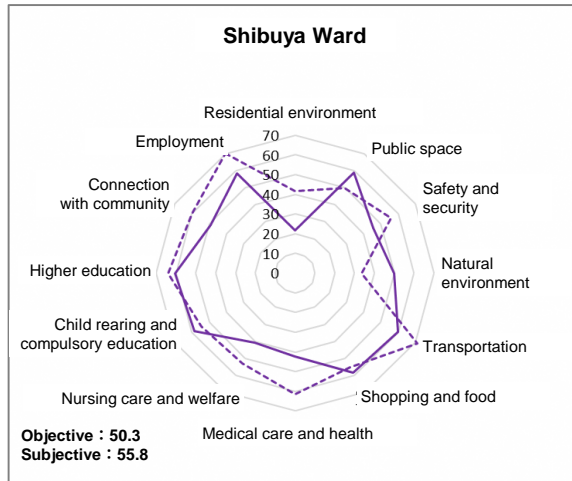
— Open Data（Objective）
-- Questionnaire（Subjective）

Chiyoda Ward
Objective : 50.8
Subjective : 59.7

Minato Ward
Objective : 49.9
Subjective : 57.5

Mean aberration value	Total	Residential environment	Public space	Safety and security	Natural environment	Transpiration	Shopping and food
Objective	50.6	28.4	59.0	52.0	49.1	57.7	53.0
Subjective	53.9	43.5	50.8	53.9	32.9	64.5	56.0
Subjective-Objective	3.3	15.0	-8.2	1.9	-16.1	6.8	3.0

| Mean aberration value	Medical care and health	Nursing care and welfare	Child rearing and compulsory education	Higher education	Connection with community	Employment
Objective	42.1	41.5	59.0	61.5	46.7	57.3
Subjective	59.6	53.4	54.9	60.4	55.7	61.4
Subjective-Objective	17.4	11.9	-4.1	-1.1	9.0	4.1

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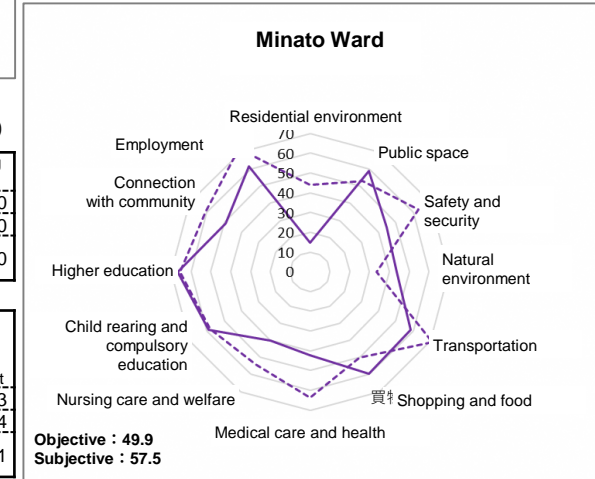
Detailed Example（Tokyo 23 Wards）
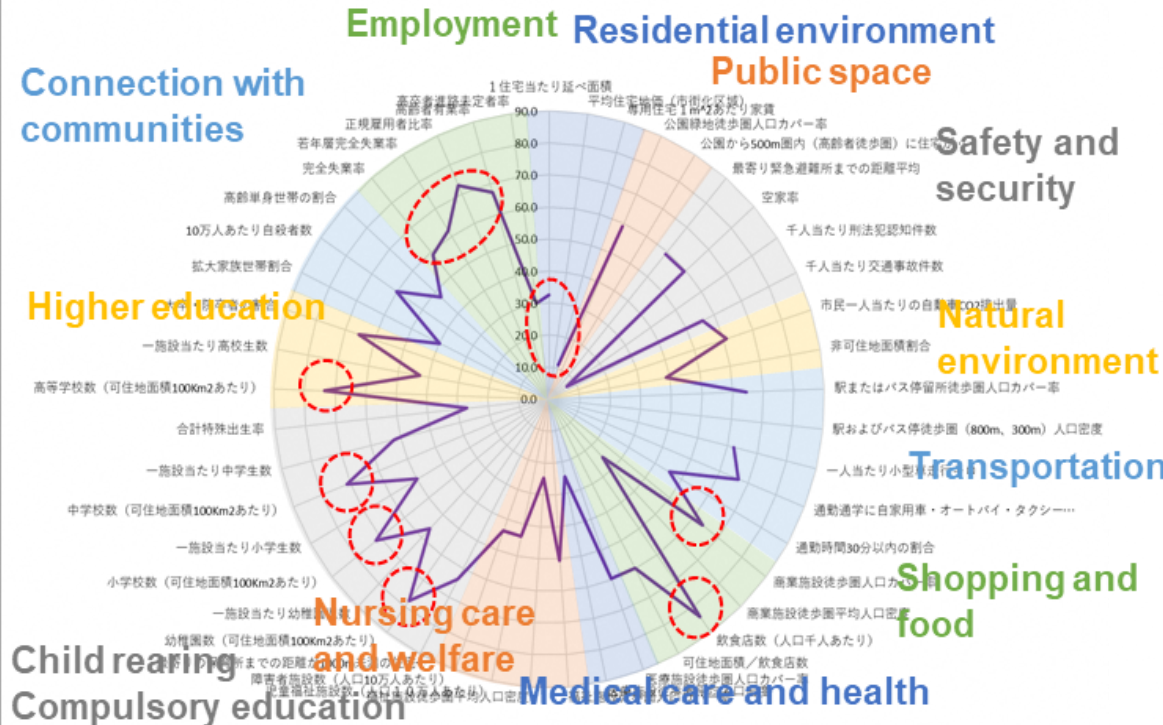
There are many commercial facilities and restaurants, a low unemployment rate and a high rate of elderly workers. There are also a large number of kindergartens and schools in the city. On the other hand, land prices and the cost of living are high.
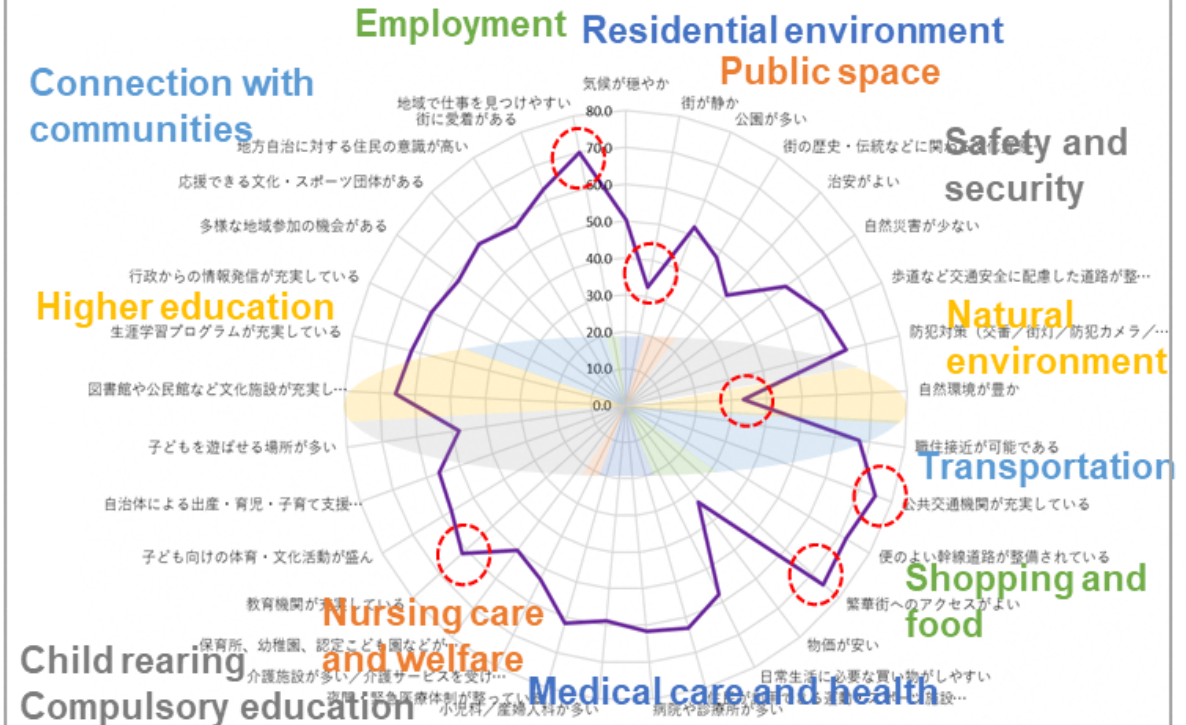
It correlates well with the Objective indicator in that it has good public transportation, educational institutions, employment, and access to the downtown area. On the other hand, they have an impression that the city is noisy and has little natural environment.

Open Data（Objective）

The image of the city is that the park is well maintained and has a lush green.Commercial facilities, medical facilities, welfare facilities, and nursery schools are well developed. On the other hand, the unemployment rate is high and the elderly labor force participation rate is lo.

Questionnaire（Subjective）

Many residents have a cultural or sports organization that they support and are attached to the city. On the other hand, due to the large number of tourists, the residents consider that the city is not very quiet. The city also has similar characteristics as metropolitan type.

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Next Steps

1. Select Super Cities （May-June, 2021）

2. Refine smart city architect concept and introduce a training program for architect-to-be

3. Implement the city O/S to expand connected cities

4. Advance "non-digital know-how" (City Management) to be covered in a new Guidebook

5. Reform laws & regulations to accelerate DX

6. Focus on actual everyday living areas and greater regions, beyond cities or municipalities

7. Further adapt new normal and focus on resilience, i.e., green deal and Covid-19 …

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Thank You

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- **Smart City Institute of Japan (SCI-J)**

  https://www.sci-japan.or.jp/english/index.html