Provisional translation

Practical approaches to the quantification of social and economic effects of green space in urban development: A case study of Umekita Redevelopment Project Phase II "Grand Green Osaka" <Summary>

August 2024

街に、ルネッサンス

UR都市機構

DBJ Development Bank of Japan

Introduction 1/3

- As represented by parks, green space in cities has diverse functions, such as contributing to solving decarbonization issues, securing a nature-positive world, and improving wellbeing. It also plays an essential role in terms of sustainable community development. In Japan, governments and private developers are working to improve green spaces in residential and commercial areas, etc. However, compared to the rest of the world, Japan has a low level of green space, and it is desirable to realize the diverse functions of green space further.

- In recent years, the Japanese government has shown a direction to work on green urban development to create sustainable communities, and the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter referred to as MLIT) has been discussing the importance of green space in cities and the promotion of private investment in green infrastructure.* In particular, the City Bureau has positioned "Urban Green Transformation (Urban GX)" as a significant policy since fiscal year 2024. It has been promoting efforts to demonstrate the diverse functions of urban green space, including revising the Urban Green Space Conservation Act and establishing a certification system for urban green space.

  * Green infrastructure refers to efforts to create sustainable and attractive national land, cities, and regions by utilizing the diverse functions of the natural environment in both hard and soft aspects, such as infrastructure development and land use—MLIT (2023), "Green Infrastructure Promotion Strategy 2023."

Introduction 2/3

- An immediate need exists to adequately quantify the diverse green space functions. However, public and private actors are not currently explaining them fully, making it difficult for them to procure the funds necessary for developing, maintaining, and operating parks and green spaces. It often leads to a lack of the creativity and ingenuity required to realize more diverse functions, which is a challenge to both the public and the private sectors.

- In this study, we attempted to quantify the various social benefits of parks and green spaces by positioning green space as an open space that is easily accessible to all and rich in greenery, providing an opportunity to resolve this issue.

- The survey covered the Umekita Second Phase Development, "Grand Green Osaka," which opened partially on September 6, 2024. Osaka, urban and long a commercial city, decided in March 2015 the "Urban Development Policy for the Second Development Zone in the Umekita Area," a call for urban development focusing on green space in the Second Umekita Development Zone, adjacent to the largest terminal station in western Japan.

- The policy defines green spaces in the area as open spaces that are freely accessible to all and rich in greenery where human activities can flourish. The aim is to make Osaka an international city with world-class urban spaces.

Introduction 3/3

- This study attempts to quantify the values of green space in urban development and to examine evaluation methods for the relationship between green space and innovation, which is the primary concept of Grand Green Osaka.

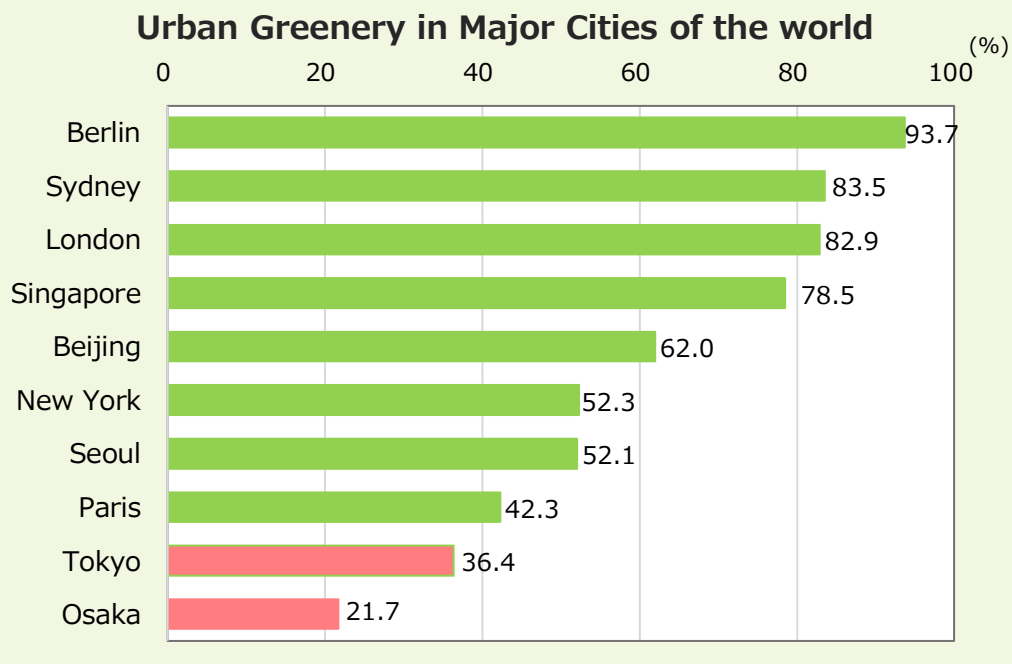
- This study was conducted based on certain assumptions before Grand Green Osaka's scheduled September 2024 opening. The logic model and estimation methods studied in this report are not yet complete in quantifying the effects of green space, and we will continue to work toward more precise quantification and monitoring after the opening.

- As a pioneer in quantifying the effects of green space, the results of this survey will stimulate discussions on the Urban GX in Japan. We want to continue our conversations beyond this survey with a wide range of players on the ideal form of urban development that includes green spaces.

Background of the study 1/2

- In recent years, urban planning focusing on green spaces (open green spaces that anyone can easily access), such as parks, has become increasingly common in urban and suburban settings.
- “Act Partially Amending the Urban Green Space Act,” promulgated on May 29, 2024, states the low level of green spaces in Japan’s urban areas compared to global standards as a reason for the amendment.
- Under these circumstances, MLIT is advancing efforts to enhance the diverse functions of urban green spaces. The explanatory documents of "Green Infrastructure Promotion Strategy 2023" and "Act Partially Amending the Urban Green Space Act" highlighted the importance of quantifying the effects and values of green infrastructure and urban green spaces.

Background of the study 2/2



Definition of Urban Greenery: the average of the indexed values of the following data

①Score of “Quality of Green and Parks” for the target city in Numbeo’s “Pollution”

②Green Coverage Proportion for the target city according to estimates based on values obtained from satellite imagery

(Source) Created by DBJ based on The Mori Memorial Foundation "Global Power City Index 2023”(November 2023)(https://www.mori-m-foundation.or.jp/ius/gpci/)GPCI Simulator

<Three perspectives cities are required to address>

①Addressing climate change

Absorption of CO2 through urban greening, etc.

Area Energy Network

②Preserving biodiversity

Conservation, restoration, and creation of habitats and growth spaces

③Improving Well-Being

Comfortable pedestrian spaces with green shading

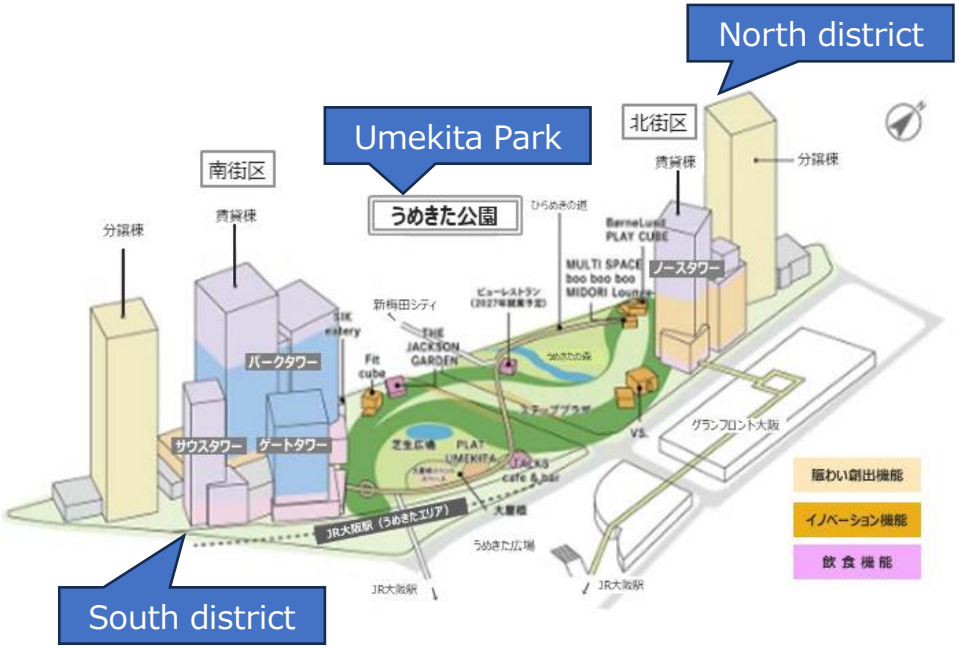
Places for environmental education

(Source) Created by DBJ based on Ministry of Land, Infrastructure, Transport and Tourism ”Explanatory materials for the Third Meeting of the Committee on Evaluation Indicators and Metrics to Secure Quality Urban Green Space through Private Sector Investment” February 16, 2024 (https://www.mlit.go.jp/toshi/city_plan/content/001724313.pdf)

Overview of Umekita Park and Grand Green Osaka 1/2

- In the Umekita Redevelopment Project Phase II area, urban development focusing on green spaces has been underway for about 10 years, with approximately eight hectares of green spaces (including water surfaces) secured across the entire area.
- The area's partial opening in September 2024 sets Umekita Park as the symbolic center of the region. Covering about 4.5 hectares, Umekita Park will be one of the largest urban parks worldwide directly linked to a major terminal station.
- The aim is to create a center for the fusion of "green spaces" and "innovation." To achieve the goal, the focus is on enhancing the overall appeal of the park by improving its convenience and vibrancy to attract a diverse range of visitors from both Japan and overseas. New experiences and learning opportunities for visitors stimulate innovation through pilot projects.

Overview of Umekita Park and Grand Green Osaka 2/2



(Sources) Created by DBJ Group based on the Osaka Station Surrounding Area Committee of the Urban Renaissance Emergency Development Council Meeting for the Osaka Station Vicinity and the Vicinity of Nakanoshima and Midosuji, “Urban Development Policy for the Second Development Zone in the Umekita Area (March 2015)” (https://www.city.osaka.lg.jp/osakatokei/page/0000305317.html); and Grand Green Osaka Official Website (https://umekita.com/).

Purpose of the study

- This study aims to quantify the diverse economic and social effects of green spaces. In particular, we will look not only at the environmental, social, and health effects of green spaces but also at their effects on the surrounding areas in urban development that focus on green spaces.
- Ultimately, the study aims to facilitate the explanation of the necessity of green spaces when securing funding for the development, maintenance, and management of green spaces. By promoting the development of urban parks, the study seeks to contribute to creating a positive cycle of urban regeneration driven by new investments.
- Regarding Grand Green Osaka, highlighted as a pioneering example with the concept of "integrating green spaces and innovation," the study also considered both how the green spaces as open spaces contribute to stimulating innovation and methods for quantifying the effects.
- The methods we used and considered in this study are still in the developmental process. Therefore, we aim to continue working with a broad range of stakeholders to advance the quantification of social effects.

Approaches to the study 1/4

- This study aims to encourage proactive efforts toward green spaces from the government and the private sector, thereby contributing to the broader adoption of urban development focusing on green spaces. Based on this goal, the study was conducted with the following objectives.
- While analyses of environmental, social, and health effects are generally conducted in other studies, the knock-on effects of urban development and city planning focusing on green space are anticipated to be even more significant.
- Recent increasing of green spaces in urban areas is expected to increase the number of people interacting with each other and revitalize local economic activities; so, urban development focusing on green space is being promoted in various regions. For this reason, this study also estimates the knock-on effects.

Approaches to this study

① **Aim to provide a clear explanation of the effects of green space to society**

② **Conduct a quantitative evaluation of the "environmental effects" and "social and health effects" for each category, and visually present the various effects of green space**
- Evaluation of some items qualitatively if they cannot be quantified

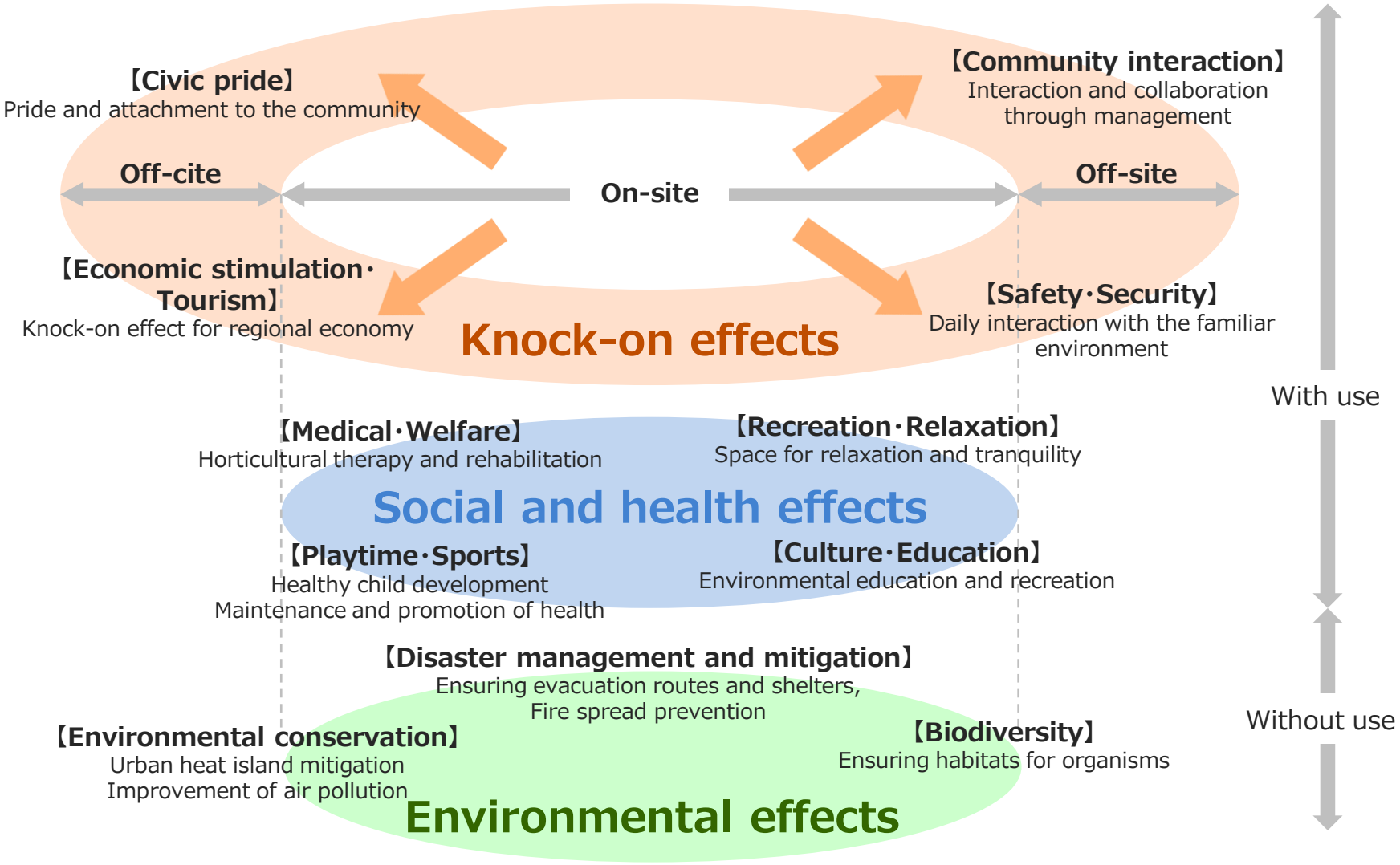
③ **Analyze the knock-on effects of the entire urban development, including surrounding areas of green space**
- Effects of green space (urban parks) + effects of the entire urban development focusing on parks
- Understanding of the relationship between social and economic values; organization of the analytical framework

④ For some items, estimate the effects over periods (e.g., up to 2030, 2050, and 2073)

⑤ Make linkages to SDGs, etc., to enhance the clarity of this study for society.

Approaches to the study 2/4

Effects of urban parks (see source below)



(Source) Takeda, Shigeaki, "Organizing the city from the park," Land Readjustment 66(4):2023.4, pp.6-14.

Approaches to the study 3/4

- MLIT (2016) lists nine subcategories of effects caused by urban parks as capital stock. Various items are assumed for the effects brought about by urban parks, including environmental effects and social and health effects, as shown in the "Manual for Cost–Benefit Analysis of Large Parks" published by MLIT.
- This study will analyze items listed as policies in “The New Basic Green Plan of Osaka City," which is positioned as the relevant upper-level plan for parks and green spaces in the Umekita Redevelopment Project Phase II.
- Specifically, the items listed in Basic Policy①, which defines individual greening policies in the plan (the other policies are for greening the town as a whole), will be replaced with quantifiable survey items.

Approaches to the study 4/4

Research items of this study determined by Basic Policy① of The New Basic Green Plan of Osaka City

Three effects	Classification as effects caused by urban parks as capital stock	Items listed in Basic Policy① of The New Basic Green Plan of Osaka City (Note 1)	Research items of this study
Environmental effects	(1) Disaster management	Green evacuation space (Policy① B.1)	Evacuation space for disaster
		Urban stormwater management (Policy① B.2)	Rainwater storage
	(2) Environmental preservation	Biodiversity (Policy① C.1)	Ecosystem and biodiversity preservation
		Urban heat island mitigation (Policy① C.2)	Urban heat island mitigation
	(3) Townscape formation	Attractive townscape (Policy① A.1)	Property value appreciation (Note 2)
Social and health effects	(4) Sports and recreation spaces	Safe and relaxing space for recreation (Policy① D.)	Healthcare cost saving
Knock-on effects	(7) Community interaction	Improving the status and image (Policy① A.2)	Fostering civic pride
		Green space attracting various people (Policy① E.1)	Stimulating innovation
	(8) Tourism promotion / (9) Economic stimulation	Sustainable development of community (Policy① E.)	Economic knock-on effect

(Sources) Created by Japan Economic Research Institute Inc. based on the Ministry of Land, Infrastructure, Transport and Tourism "Guideline for improving effects of urban parks as stock capital" May 2016 (https://www.milt.go.jp/common/001135262.pdf) and Osaka City "The New Basic Green Plan of Osaka City" November 2013 (https://www.city.osaka.lg.jp/kensetsu/page/0000239835.html).

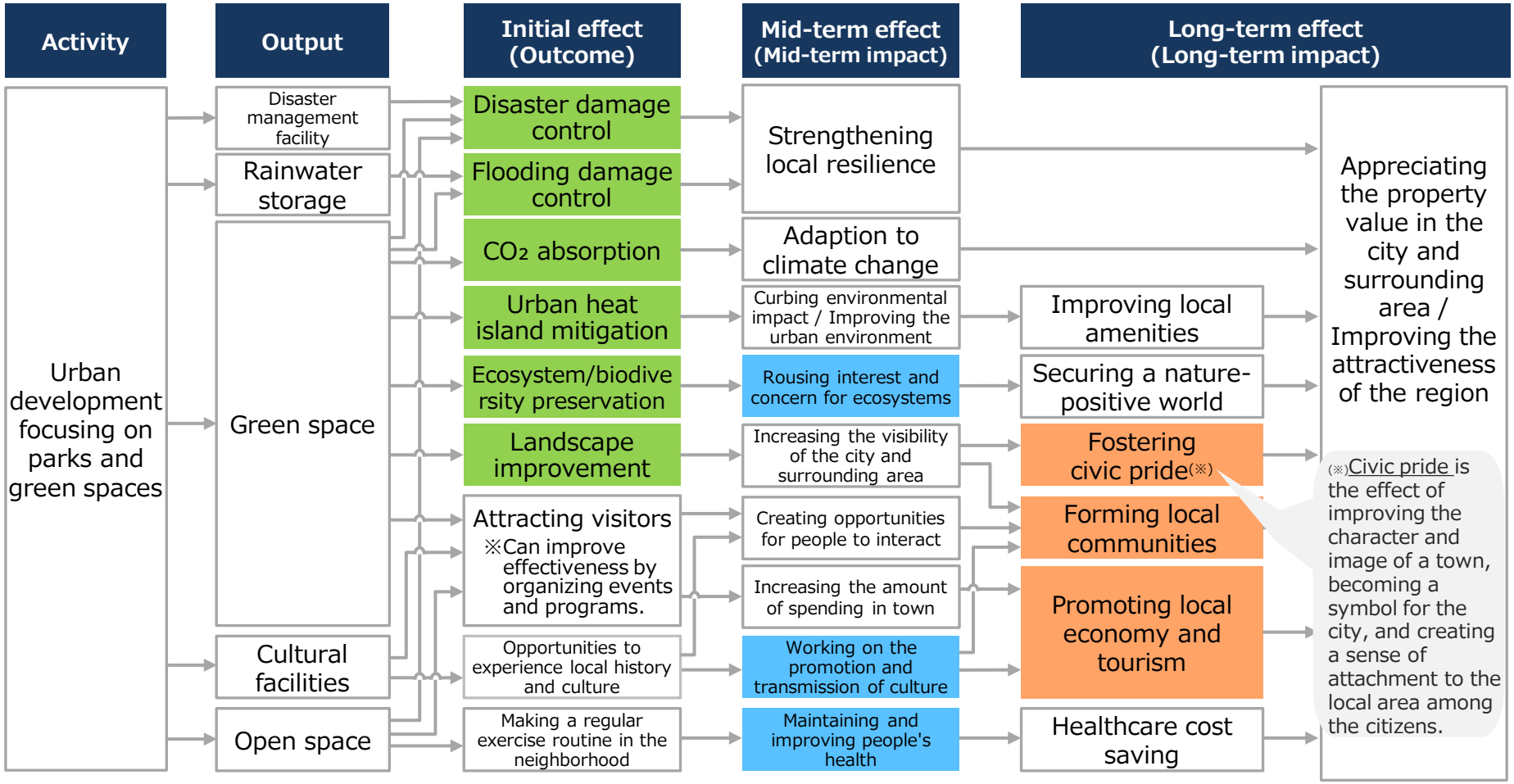
(Note 1) In addition to the items listed in the table above, Basic Policy① also includes "E. 2) Green spaces where people can feel close to nature" and "E. 3) Creation of green spaces that people can actually feel," but these are policies for installing greenery and are not the subject of this survey.

(Note 2) This study has taken up "property value appreciation" as a research item that represents "townscape formation" and "attractive townscapes." but property values are determined not only by the surrounding townscape, but also by various factors such as the amenities, growth potential of the town, disaster management, the natural environment, image, and so on. Therefore, in the following, we will place this as one of the knock-on effects, not as one of the environmental effects.

Logic model (Urban development focusing on parks)

■ The following is a logic model of how urban development focusing on parks and green spaces can bring about the envisioned impacts in urban parks.

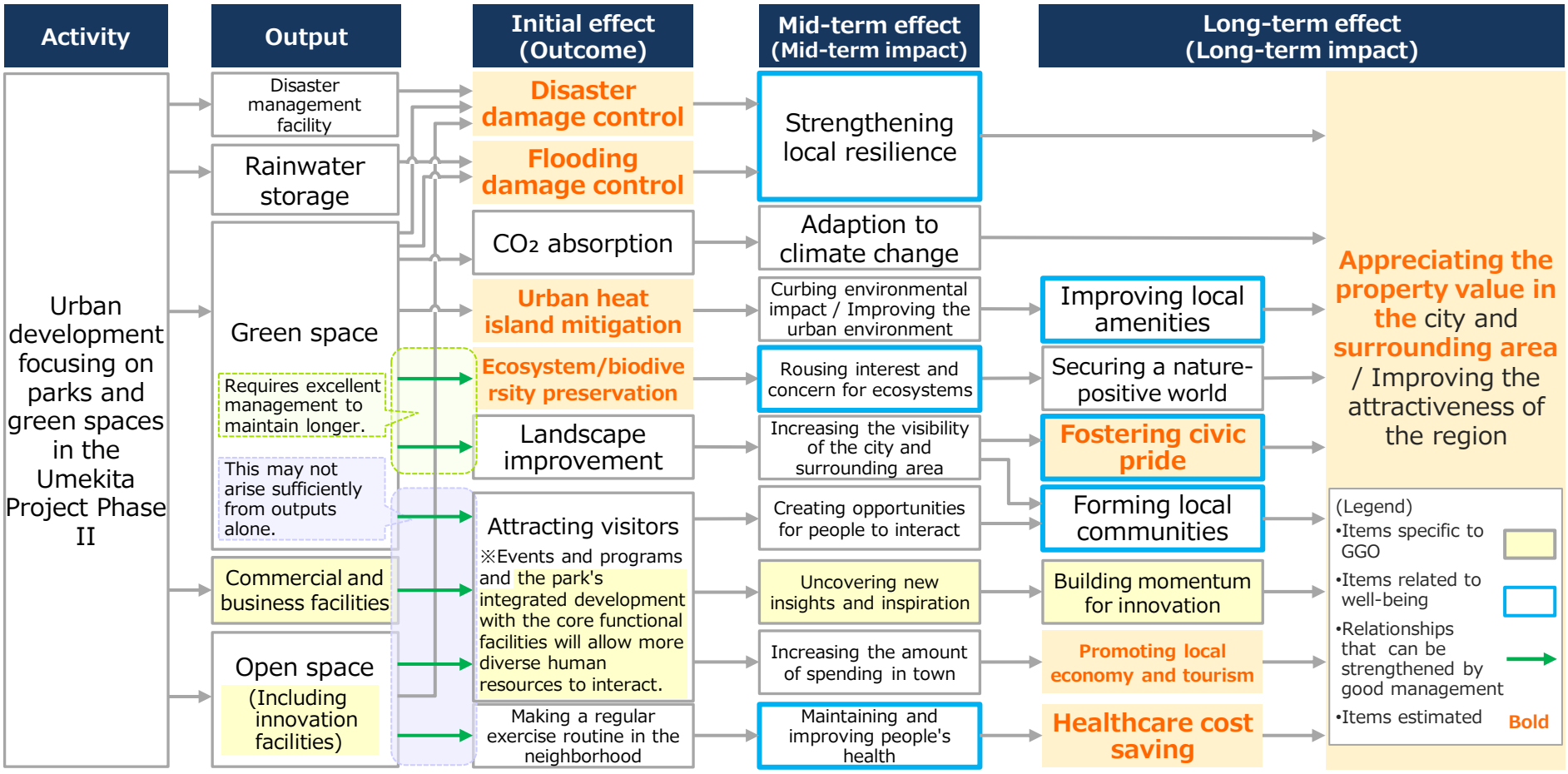
Draft of a logic model for various effects of urban parks



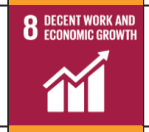
Logic model (Grand Green Osaka)

■ While Grand Green Osaka will have various effects, we organized the logic model as follows, based on the concept of a fusion center of green space and innovation that aims to improve the quality of life of citizens and visitors and stimulate innovation for companies and other entities.

Draft of a logic model for Grand Green Osaka



SDGs corresponding to the research items

Research Item	SDGs		
	Goal	Targets	
Evacuation space for disaster Rainwater storage		13.1	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
Ecosystem and biodiversity preservation		15.1	By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
Urban heat island mitigation		11.6	By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
Property value appreciation		11.3	By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
Healthcare cost saving		11.7	By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
Fostering civic pride		11.7	By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
Economic knock-on effect (Tourism)		8.9	By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
Economic knock-on effect(revitalization of the local economy)		11.a	Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning
Stimulating innovation		9.5	Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

(Source) Created by Japan Economic Research Institute Inc. based on the Ministry of Foreign Affairs of Japan "SDG Indicators" (https://www.mofa.go.jp/mofaj/gaiko/oda/sdgs/statistics/index.html)

Summary of estimation results 1/2

- In exploring the estimation methods while emphasizing scientific basis and objectivity, we also considered the ease of understanding the methods and results and the ease of application to other parks, green spaces, and green infrastructure in light of the purpose of this study.
- Since there was no actual data, such as visitors, at the time of this survey, we evaluated based on certain assumptions.
- Since it is difficult to evaluate "stimulating innovation" in advance, this study did not conduct an estimation. Instead, it presented a direction for evaluation after the project's completion, based on a summary of Grand Green Osaka's characteristics related to stimulating innovation.

Summary of estimation results 2/2

Summary of estimation results in each research item

Research item	Estimation method	Summary of estimation results
Direct effects from green space		
Evacuation space for disasters	Estimation of the value of lives of survivors	The maximum estimation of the value is 1.2 billion yen for the Uemachi Fault Zone (earthquake) and 200 million yen related to a Nankai Megathrust earthquake.
Rainwater storage	Estimation of sewerage cost saving of drainage	5.7 million yen in sewerage cost is saved every year.
Ecosystem and biodiversity preservation	Contingent valuation method (CVM)	Annual benefits from ecosystem and biodiversity preservation are 0.8 billion yen for Osaka City and 1.9 billion yen for Osaka Prefecture.
Urban heat island mitigation	Estimation of heat emissions using the heat load model for urban heat island effect	The amount of heat emissions at 2:00 pm, the peak hour, is reduced to a quarter of that of a typical office building development.
Healthcare cost saving	Estimation of healthcare cost saving due to walking and sports	830 million yen in healthcare cost are saved every year.
Impacts of urban development focusing on green space		
Property value appreciation	Estimation of a land price function based on the hedonic approach	Land prices around the park rise by 3.4% to 19.4%.
Fostering civic pride	Contingent valuation method (CVM)	Annual benefits from fostering civic pride are 1.6 billion yen for Osaka City and 3.8 billion yen for Osaka Prefecture.
Economic knock-on effect	Input–output table analysis	The knock-on effects in Osaka Prefecture amount to 63.9 billion yen per year.
Stimulating innovation	Questionnaire survey on attributes and behavior of visitors	(Estimation after the completion of Grand Green Osaka)

(Source) Japan Economic Research Institute Inc.

Evacuation space for disasters 1/4

- Umekita Park has been developed as an “urban park with the function of an open-area evacuation space” and is intended to serve as a large-scale evacuation space in the event of a disaster.
- Urban parks that serve as open-area evacuation spaces are expected to have several effects. This study focused on the following aspects: “delaying or preventing the spread of fire,” “emergency evacuation space for nearby residents,” “ final evacuation space in case of a large fire,” and “temporary shelter for people who are unable to return home.”
- In this study, we examined two potential earthquakes: the Uemachi Fault Zone Earthquake and the Nankai Megathrust Earthquake. We anticipated that the expected number of casualties due to "fire/spread of fire" for each earthquake would be nearly zero. Therefore, we focused on "building collapse" as the primary factor contributing to human casualties.
- Therefore, the value of Umekita Park as an evacuation space for disasters was quantified by the amount of damage avoided during a disaster due to the establishment of the evacuation space (estimation of the value of lives of survivors).

Evacuation space for disasters 2/4

Primary roles of disaster prevention parks (in time series)

Pre-disaster	Immediately after the disaster ～ approx. 3hours	approx. 3hours ～ 3 days	After approx. 3 days
Preparation phase	Immediate aftermath of a disaster	Emergency phase	Urgent/recovery and reconstruction phase
Venue for disaster prevention education	○Delaying or preventing the spread of fire ○Emergency evacuation space for nearby residents ○Final evacuation space in case of a large fire		
	○Hub for relief operations ・Hub for relief operations by Self-Defense Forces, police etc. ・Hub for wide-area firefighting activities ・Site for rescue operations etc. ○Temporary shelter for people who are unable to return home (If there are appropriate facilities)	○Temporary evacuation shelter ○Site for relief operations ・Site for gathering and communicating local disaster prevention information ・Site for receiving relief supplies	○Hub for recovery and reconstruction activities ・Assembly place for recovery and reconstruction teams ・Logistics hub for the accumulation and sorting of materials and equipment ・Hub for carrying in/out of large vehicles etc. and parking ・Land for temporary housing etc.

(Source) Created by DBJ group based on National Institute for Land and Infrastructure Management "Guideline for planning, design and management of disaster prevention parks (2nd revised version)" September 2017(https://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0984.htm),
Osaka City "The Osaka City Regional Disaster Prevention Plan" April 2023 (https://www.city.osaka.lg.jp/kikikanrishitsu/page/0000011958.html),
Osaka Prefectural Government "Osaka Prefecture Comprehensive Disaster Prevention Measures Report on Natural Disasters (earthquake damage estimation)" March 2007(https://www.pref.osaka.lg.jp/documents/84912/02.pdf),
Osaka Prefectural Government "4th Meeting of the Nankai Megathrust Earthquake Disaster Measures Review Committee, Reference Materials" October 2013 (https://www.pref.osaka.lg.jp/o020080/kikikanri/keikaku_higaisoutei/bukai.html)

(Note) The buildings of Grand Green Osaka are designed to maintain functionality during heavy rain or flooding from tsunami by placing critical equipment rooms on intermediate floors or the rooftop. Additionally, it is possible that Grand Green Osaka could be designated as a tsunami evacuation building, similar to Grand Front Osaka

Evacuation space for disasters 3/4

Concept of the estimation of the value of lives of survivors

■ **Estimation of the value of lives of survivors of Umekita Park in each earthquake type, in Japanese yen**

＝Cost of human casualty (yen/per person) × Estimated number of human casualties in Kita Ward by the earthquakes × Temporary evacuation population of Umekita Park/daytime population of Kita Ward

- **Cost of human casualty:** We used loss due to death, residual disability, and disability (lost profits, treatment-related expenses, and funeral expenses) indicated in the survey by the Cabinet Office, Government of Japan, “Survey on the economic analysis of traffic accident damage and loss” (March 2023).
- **Estimated number of human casualties in Kita Ward by the earthquakes:** We used data indicated in Osaka City’s “The Osaka City Regional Disaster Prevention Plan” (April 2023); Osaka Prefectural Government’s “Osaka Prefecture Comprehensive Disaster Prevention Measures Report on Natural Disasters (earthquake damage estimation)” (March 2007); and Osaka Prefectural Government’s “4th Meeting of the Nankai Megathrust Earthquake Disaster Measures Review Committee, Reference Materials” (October 2013).
- **Temporary evacuation population of Umekita Park**: We used data indicated in the Public Works Bureau, City of Osaka’s “Basic plan for Ofuka-cho Park” (March 2019).
- **Daytime population of Kita Ward**: We used data indicated in Osaka City’s “Population Census (Daytime population of Osaka City)” (August 2023).

Evacuation space for disasters 4/4

Estimation of the value of lives of survivor of Umekita Park as an evacuation space for disaster

Name	Time of occurrence	Damage situation	Cost of human casualty (Thousand yen /per person)		Estimated number of human casualties in Kita Ward (Unit: #of people)		Temporary evacuation population of Umekita Park/Daytime population of Kita Ward		Estimation of the value of lives of survivors (Unit: 100 million yen)	Total (Unit: 100 million yen)
Uemachi Fault Zone Earthquake										
	Daytime	Decease	15,621		754		34,000 people /420,354 people		9.53	
		Injury	177	×	5,890	×		=	0.84	11.82
		Serious injury	5,957		300				1.45	
Nankai Megathrust Earthquake										
	12 noon in summer	Decease	15,621		5		34,000 people /420,354 people		0.06	
		Injury	177	×	217	×		=	0.03	0.22
		Serious injury	5,957		27				0.13	

(Source) Created by Japan Economic Research Institute Inc. based on Cabinet Office, Government of Japan “Survey on the economic analysis of traffic accident damage and loss” March 2023 (https://www8.cao.go.jp/koutu/chou-ken/r04/),
Osaka City “The Osaka City Regional Disaster Prevention Plan” April 2023(https://www.city.osaka.lg.jp/kikikanrishitsu/page/0000011958.html),
Osaka Prefectural Government “Osaka Prefecture Comprehensive Disaster Prevention Measures Report on Natural Disasters (earthquake damage estimation)” March 2007 (https://www.pref.osaka.lg.jp/documents/84912/02.pdf),
Osaka Prefectural Government “4th Meeting of the Nankai Megathrust Earthquake Disaster Measures Review Committee, Reference Materials” October 2013 (https://www.pref.osaka.lg.jp/o020080/kikikanri/keikaku_higaisoutei/bukai.html),
The Public Works Bureau, City of Osaka “Basic plan for Ofuka-cho Park” March 2019 (https://www.city.osaka.lg.jp/kensetsu/cmsfiles/contents/0000487/487112/01kihonnkeikau1.pdf)、
Osaka City “Population Census (Daytime population of Osaka City)” August 2023(https://www.city.osaka.lg.jp/toshikeikaku/page/0000572638.html)

Rainwater storage 1/2

- To estimate the effect of rainwater storage, we first calculated the volume of rainwater runoff from Umekita Park. Then, we estimated the treatment cost savings if the rainwater runoff was treated through green infrastructure (e.g., green spaces) instead of the sewer system.
  (1) Estimate the volume of rainwater runoff, assuming the entire area of Umekita Park is paved.
  (2) Estimate the volume of rainwater runoff from Umekita Park after the park's development.
  (3) Assume that each volume of rainwater is treated through the sewer system. Estimate the reduction in sewerage treatment costs, considering the reduction as the effect of rainwater storage achieved by the development of Umekita Park.
- Annual savings of 5.71 million yen in sewerage treatment costs can be achieved based on the calculation described above.

Rainwater storage 2/2

(1)Estimate the volume of annual rainwater runoff, assuming the entire area of Umekita Park is paved

= 0.9(average runoff coefficient)×1.6 ㎥/㎡ ×4.4998ha (drainage area)

= 6.479712 ≒ 64,797㎥

(2)Estimate the volume of annual rainwater runoff volume from Umekita Park after the park's development

= 0.583(average runoff coefficient)×1.6 ㎥/㎡ ×4.4998ha (drainage area)

= 4.19741 ≒ 41,974㎥

(3) Assume that each volume of rainwater is treated through the sewer system. **Estimate the reduction in sewerage treatment costs as the effect of rainwater storage achieved by the development of Umekita Park.**

= 16.2million yen－10.49million yen

= **5.71million yen per year**

Note :

・Annual sewerage treatment costs in (1)
= 64,797㎥×250yen＝16,199,250yen
≒**16.2million yen**

・Annual sewerage treatment costs in (2)
= 41,974㎥×250yen＝10,493,500yen
≒**10.49million yen**

(Note) The unit price for annual sewerage treatment cost is an estimate based on the actual results of local governments, and does not distinguish between "separate sewer system" and "combined sewer system"

(Source) Technical Committee of Green Infrastructure Public-Private Partnership Platform "Approach to green infrastructure evaluation and its examples" November 2023(https://green-infra-pdf.s3.ap-northeast-1.amazonaws.com/グリーンインフラ評価の考え方とその評価例.pdf),
Western Japan Branch Office of Urben Renaissance Agency・NIKKEN SEKKEI LTD "02−Report on detailed design work for urban park in Osaka City Kita Ward, Ofukacho (Umekita Redevelopment Project Phase II) area"(March 2021).
The average runoff coefficient is calculated by Japan Economic Research Institute Inc.

Ecosystem and biodiversity preservation 1/6

- In this study, we focused on two items listed by MLIT (2024) for studying the effects of urban green spaces on biodiversity: "preservation of a diverse habitat and growth environments" and "harmony with the surrounding environment."
- MLIT (2004) proposed various methods for measuring project effectiveness. However, there are no available unit values, comparable cases, correlated land price data, or data indicating usage value for the content we aim to investigate in this study. Therefore, this study used the contingent valuation method (CVM) as a method of estimation.

Ecosystem and biodiversity preservation 2/6

Evaluation items for urban green spaces in preservation of biodiversity (draft version)

Category	Evaluation items
Conservation and restoration of natural landscapes, etc.	Natural landscape conservation
	Topsoil conservation
Conservation of water resources	Reduction of water use
Preservation of a diverse habitat and growth environment	Hierarchical structures
	Preservation of cohesive green spaces
	Ecotones
	Initiatives contributing to a good habitat and growth environment formation
Harmony with the surrounding environment	Vegetation rooted in the local community
	Ecosystem networks
Reduction of the impact on the ecosystem	Conservation of rare species
	Prevention from alien species
	Reduction of chemical pesticides and chemical fertilizers
	Management of chemical substances
	Procurement considering biodiversity/sustainability
Environmental education	Environmental education

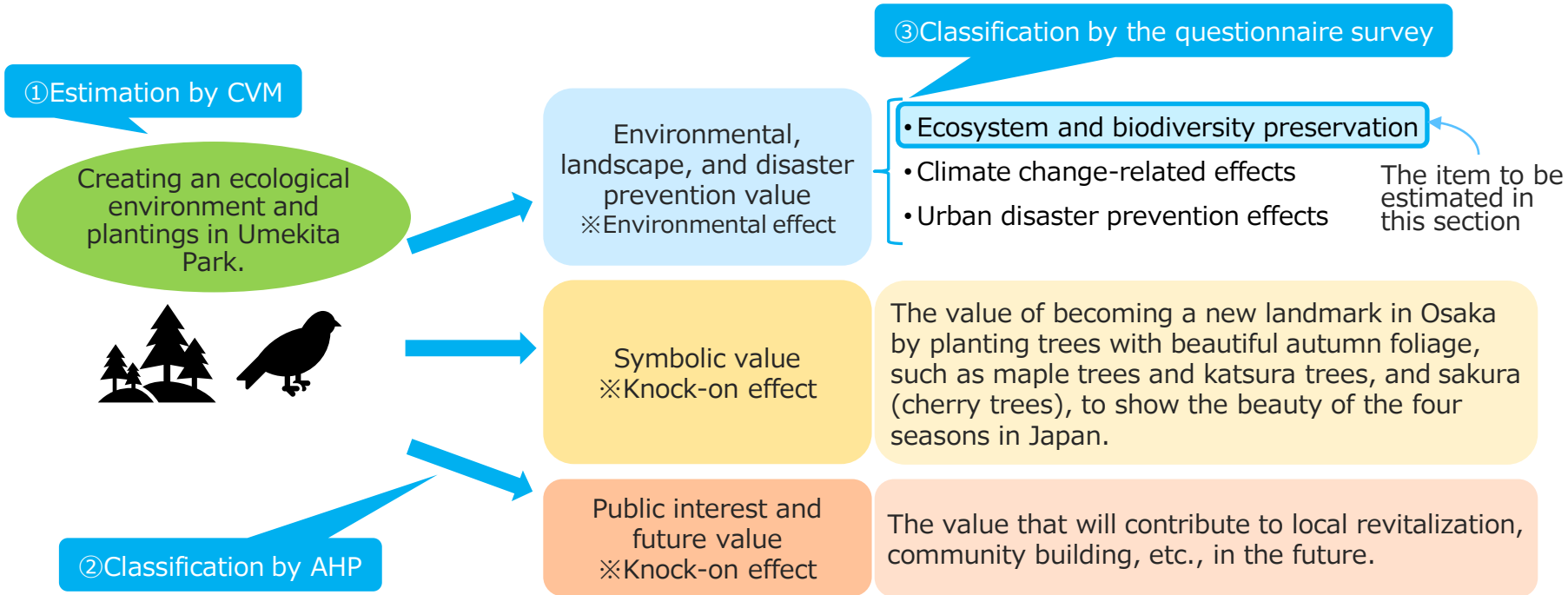
(Source) Created by Japan Economic Research Institute Inc. based on Ministry of Land, Infrastructure, Transport and Tourism, "Explanatory materials for the Fourth Meeting of the Committee on Evaluation Indicators and Metrics to Secure Quality Urban Green Space through Private Sector Investment" June 26, 2024 (https://www.mlit.go.jp/toshi/city_plan/content/001751514.pdf).

Ecosystem and biodiversity preservation 3/6

- Specifically, to determine the willingness to pay (WTP) of residents in the case of collecting contributions from each household to implement only the ecological environment and plantings of the entire Umekita Park development project, an online questionnaire survey (1,100 respondents in total) was conducted among residents of Osaka Prefecture to determine the annual benefits, as shown in ① on the next page.
- However, since these benefits include values other than the preservation of ecosystems and biodiversity, we also used the Analytic Hierarchy Process (AHP) in the above questionnaire survey to classify the benefits into “environmental, landscape, and disaster prevention value,” “symbolic value,” and “public interest and future value,” shown in ② on the next page.
- Furthermore, based on the results of a question in the same survey that asked about the expected role of Umekita Park, the benefits categorized as “environmental, landscape, and disaster prevention value” were further classified into “ecosystem and biodiversity preservation,” “climate change–related effects,” and “urban disaster prevention effects,” as shown in ③ on the next page.

Ecosystem and biodiversity preservation 4/6

Process of estimating the ecosystem and biodiversity preservation of Umekita Park in this survey



(Source) Japan Economic Research Institute Inc.

(Note) Analytic Hierarchy Process (AHP) is a method of evaluating multiple things using multiple criteria by first taking any two of the criteria and comparing them on a one-to-one basis, then integrating the results of all comparisons (one-to-one comparison). The results are then used as the basis for a pair-wise comparison of the objects to assess them. In this analysis, one-to-one comparisons are made only for the evaluation criteria, and the degree of importance among the evaluation criteria is estimated.

Ecosystem and biodiversity preservation 5/6

- Using CVM, the average WTP per household for creating an ecological environment and plantings was estimated to be 3,638 yen in Osaka City and 2,938 yen for Osaka Prefecture. When these amounts are multiplied by the number of households in Osaka City and Osaka Prefecture, the annual benefits from such a project are estimated to be 5.7 billion yen in Osaka City and 13.3 billion yen in Osaka Prefecture.
- Then, based on the results of the AHP, we estimated the portion corresponding to "environmental, landscape, and disaster prevention." We estimated the value corresponding to "ecosystem and biodiversity preservation" to be 800 million yen in Osaka City and 1.8 billion yen in Osaka Prefecture.
- Assuming that these benefits will be obtained annually throughout the operation period, we estimated the discounted present value of each benefit for the years up to 2030, 2050, and 2073 (50 years from the partial opening of the park). The results are shown in the table on the next page. We used a 4% discount rate.

Ecosystem and biodiversity preservation 6/6

Discounted present value of the benefits delivered from the preservation of environments and plantings with consideration for ecosystems (100 mil. Yen)

Scope: Osaka City	1 year	Discounted present value		
		Until 2030	Until 2050	Until 2073
Total benefits	57.20	314.14	928.49	1,235.00
Value of environmental, landscape, disaster prevention	23.62	129.73	383.44	510.02
Ecosystem and biodiversity preservation	7.90	43.41	128.29	170.64

Scope: Osaka Prefecture	1 year	Discounted present value		
		Until 2030	Until 2050	Until 2073
Total benefits	133.06	730.77	2,159.90	2,872.92
Value of environmental, landscape, disaster prevention	55.13	302.77	894.88	1,190.29
Ecosystem and biodiversity preservation	18.48	101.48	299.94	398.95

※ When evaluating the long-term value of ecosystems and biodiversity, it is important to recognize the risk of negative impacts on human life and consider the necessity of balancing both aspects. However, there is no established method for quantifying such risks, and in this estimation, these negative aspects have not been explicitly addressed.

(Source) Created by Japan Economic Research Institute Inc. based on Kuriyama, Koichi, Takahiro TSUGE and Yasushi SHOJI. "Introduction to the Environmental Valuation," Keiso Shobo, 2013,
Japan Geographic Data Center "Osaka Prefecture population and household numbers by municipality –April 2023 Survey"

Urban heat island mitigation 1/2

- We compared the heat emissions into the atmosphere from Umekita Park (heat from rooftops, air conditioning and hot water supply, walls, and ground surface) between two scenarios:“ the condition where Umekita Park (green space) is developed according to the business plan” and “ the condition where standard office buildings are developed on the site of Umekita Park.“
- We used Osaka Prefecture’s “Heat load calculation model for heat island mitigation” to estimate the hourly heat load fluctuations for Umekita Park and the comparative case (paved area).

Cases assumed in this study

Umekita Park

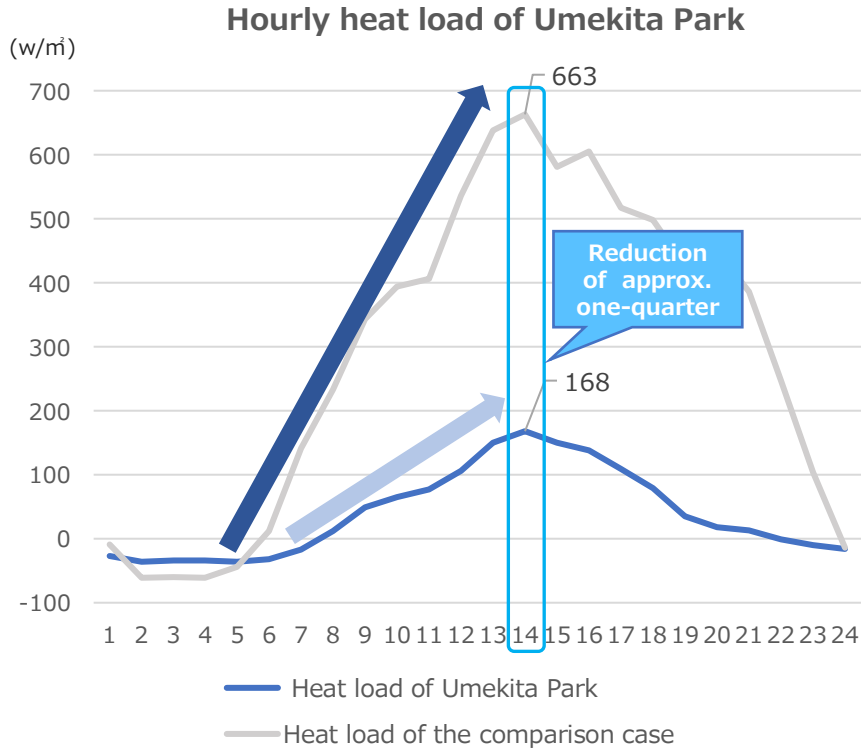
- The area and breakdown of buildings and site are based on the basic design and information from the Grand Green Osaka website.
- However, we made assumptions for detailed information that was not publicly available at the time of the survey.

Comparative case

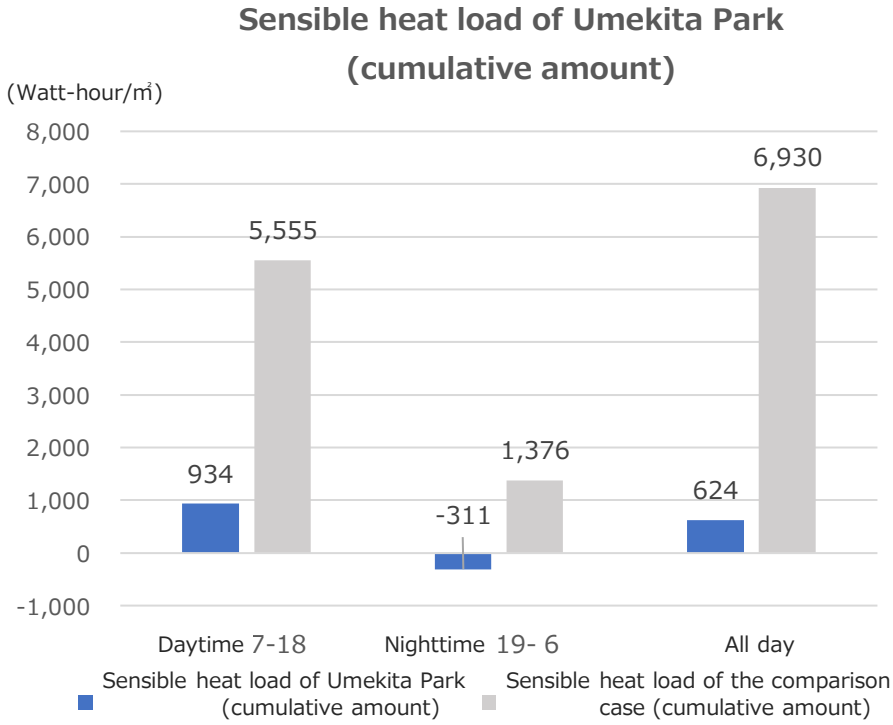
- Assuming that the Umekita Park site is not designated as a park but developed with buildings and the surrounding area was paved
- Specifically, assuming that in both North Park and South Park, in accordance with the use district of the area (commercial area), an 18-story building, which has the lowest number of floors planned within Grand Green Osaka, is constructed on 80% of the site area, while the remaining area is paved.

Urban heat island mitigation 2/2

- As a result of the estimation, the development of Umekita Park could reduce the heat load by one-quarter at the peak emission time of 2 PM, compared to the development of office buildings.
- Additionally, in the comparison case with the office buildings, heat load is generated not only during the day but also at night. In contrast, in Umekita Park, heat load is absorbed during the night, leading to a significantly reduced cumulative heat load over the entire day.



(Source) Japan Economic Research Institute Inc.



(Source) Japan Economic Research Institute Inc.

Healthcare cost saving 1/2

- We estimated the effects of habitual walking in the park. Assuming the annual number of visitors to Umekita Park is 10 million, the savings in healthcare costs were estimated to be approximately 670 million yen per year.
- Additionally, since Umekita Park will provide various facilities that offer opportunities for sports participation, we also estimated the effect of residents living near the park, who previously lacked a regular exercise routine, starting to engage in habitual exercise through programs and guidance provided by trainers.
- Assuming that 5% of people begin sports through programs and guidance provided by trainers, the savings in healthcare costs due to the establishment of regular exercise habits from the development of Umekita Park was estimated to be approximately 160 million yen per year

Healthcare cost saving 2/2

Approaches to estimation

Annual healthcare cost savings from individuals who regularly visit and walk in Umekita Park	=	Healthcare cost savings per step of daily walking	×	Increase in daily steps per person during park visits compared to general outings	×	% of individuals (on a cumulative basis) who visit urban parks with similar characteristics to Umekita Park at least twice a week	×	Estimated annual number of cumulative visitors to Umekita Park
(approx.670million yen)		(0.065yen)		Female 2,714 steps Male 2,235 steps		Female 12.61% Male 31.12%		(10million people)

(Source) Created by Japan Economic Research Institute Inc. based on Ministry of Land, Infrastructure, Transport and Tourism "Guidance for conducting walking volume (step count) surveys to understand the health promotion effects in urban development" March 2017(https://www.mlit.go.jp/common/001186372.pdf), Showa Kinen Park Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism "Health promotion at Showa Kinen Park ! Walking in the park reduces elderly healthcare costs by approximately 200 million yen," press release on June 8, 2017(https://www.ktr.mlit.go.jp/showa/topics/170608showa.pdf)

Annual healthcare cost savings from individuals who developed exercise habits due to the development of Umekita Park	=	Annual healthcare cost savings per person resulting from habitual exercise	×	Population around Umekita Park (evacuation area population as of March 2024)	×	% of individuals without a regular exercise habit	×	Assumed % of individuals starting exercise based on guidance and programs from trainers
(158.01million yen)		(78,246yen)		(57,125 people)		(70.7%)		(5%)

(Source) Created by Japan Economic Research Institute Inc. based on Ministry of Education, Culture, Sports, Science and Technology "FY2014 Sport policy research (study on the economic impacts of sports) survey report" August 2014 (https://www.mext.go.jp/a_menu/sports/chousa/detail/1353864.htm), Ministry of Health, Labor and Welfare "Overview of the results of the National Health and Nutrition Survey in Japan, 2019" October 2020 (https://www.mhlw.go.jp/content/10900000/000687163.pdf) 、Osaka City "Population based on the Basic Resident Registration" (https://www.city.osaka.lg.jp/shimin/page/0000006893.html)、Park and health network Japan"Park network utilization promotion project for achieving a healthy and vibrant society" May 2019, Tokyo Metropolitan Government Bureau Of Citizens, Culture And Sports "Exercise in the office: a guidebook for establishing exercise habits in the working generation" March 2018(https://www.sports-tokyo-info.metro.tokyo.lg.jp/pdf/office_exercise_guide_book.pdf)

Property value appreciation 1/4

- To estimate the effects on land prices, we estimated the land price function based on the "hedonic approach," a standard method for evaluating real estate prices. The study area encompassed all of Osaka City, with land price data obtained from 167 locations in commercial areas based on the value of the standard site for 2023. The analysis results showed satisfactory accuracy for the land price function.
- The results indicate that land prices in commercial areas of Osaka City are influenced by factors such as accessibility to office buildings and commercial facilities, the size of the land, and the floor area ratio.
- In a study by Komatsu (2008), focusing on Chiyoda, Minato, and Chuo wards in Tokyo, the accessibility coefficients for parks were significant. However, in our Osaka City estimation such significance was not observed. A potential reason for this discrepancy could be that while Tokyo has large parks like Hibiya Park and Shiba Park in its central areas, Osaka, with its long history as a commercial city, has limited such locations in its downtown, with larger parks being dispersed in the suburbs.

Property value appreciation 2/4

Land price function estimated in this study

value of standard site(yen/㎡)
= Intercept β0
+ Coefficient β1 × Accessibility index for parks
+ Coefficient β2 × Accessibility index for business facilities
+ Coefficient β3 × Accessibility index for commercial facilities
+ Coefficient β4 × Road distance to the nearest station(m)
+ Coefficient β5 × Site area(㎡)
+ Coefficient β6 × Width of the front road(m)
+ Coefficient β7 × Floor area ratio(%)
+ Coefficient β8 × Major station dummy

Definition of park accessibility index(ACC)
※ACC is an index that indicates the quality of access to target facilities at various locations

Park ACC for location X
= (Area of Park1)÷(Distance from location X to Park1)$^{\text{Distance decay factor}}$
+ (Area of Park2)÷(Distance from location X to Park2)$^{\text{Distance decay factor}}$
+ (Area of Park3)÷(Distance from location X to Park3)$^{\text{Distance decay factor}}$
+ … +
+ (Area of Park n)÷(Distance from location X to Park n)$^{\text{Distance decay factor}}$

Target of accessibility data

Park : 18 parks in Osaka City with a site area of 4.5 hectares or more (excluding those where sports fields or ponds occupy the majority of the park)

Business facility : 19 office buildings listed by CBRE (2018)

Commercial facility : 25 shopping centers with a retail area of 1 hectare or more

(Source) Created by Japan Economic Research Institute Inc. based on Ministry of Land, Infrastructure, Transport and Tourism "Draft manual for cost-benefit analysis of urban redevelopment projects (revised 2nd edition, FY2018)"(https://www.mlit.go.jp/toshi/city/sigaiti/content/001736534.pdf)、
Hiroaki Komatsu "A Study on Land Pricing Structure of Urban Public Parks in Commercial Areas," The Japanese Journal of Real Estate Sciences, Volume21, Issue 4, 2008.4,
CBRE "Analysis of business areas in Osaka City" December 18, 2018(https://www.cbre-propertysearch.jp/article/innovation_in_osaka_city-vol1/),
Japan Council of Shopping Centers "List of shopping centers in Japan" (https://www.jcsc.or.jp/data/basic.html)

Property value appreciation 3/4

- Based on the estimation results, we can infer the changes in land prices around Grand Green Osaka. With the completion of Grand Green Osaka, it is anticipated that access to parks, office buildings, and commercial facilities in the surrounding area will improve, leading to an increase in land prices.
- Therefore, we recalculated the accessibility index for 12 locations among the 167 standard sites, which are within 1 km of the Grand Green Osaka central area. We used the planned park area, office area, and commercial facility area at Grand Green Osaka for the calculation.
- Based on these calculations, we estimated the theoretical value of the 12 locations and calculated the rate of increase compared to the theoretical value from the 2023 data. As shown in the table on the following page, the completion of Grand Green Osaka is projected to increase surrounding land prices by approximately 3.4% to 19.4%.

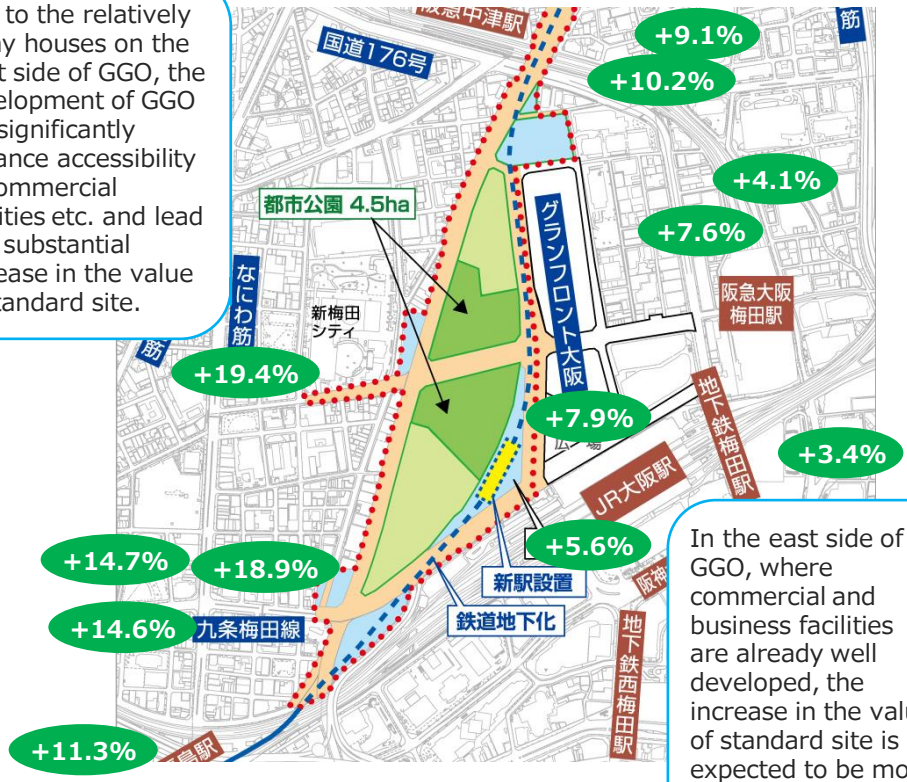
Property value appreciation 4/4

Increase in the value of standard site around Grand Green Osaka after completion, calculated based on the land price function

Location	Distance from the center of the GGO project(m)	Increase in theoretical price after the completion of GGO
Kakudacho	690	3.4%
1 Shibata	530	7.6%
3 Toyosaki	750	10.2%
1 Oyodominami	470	19.4%
Chayamachi	670	4.1%
2 Oyodominami	710	14.7%
3 Toyosaki	900	9.1%
Ofukacho	220	7.9%
1 Umeda	570	5.6%
6 Fukushima	460	18.9%
7 Fukushima	650	14.6%
7 Fukushima	920	11.3%

(Source) Japan Economic Research Institute Inc.

Due to the relatively many houses on the west side of GGO, the development of GGO will significantly enhance accessibility to commercial facilities etc. and lead to a substantial increase in the value of standard site.



In the east side of GGO, where commercial and business facilities are already well developed, the increase in the value of standard site is expected to be more gradual.

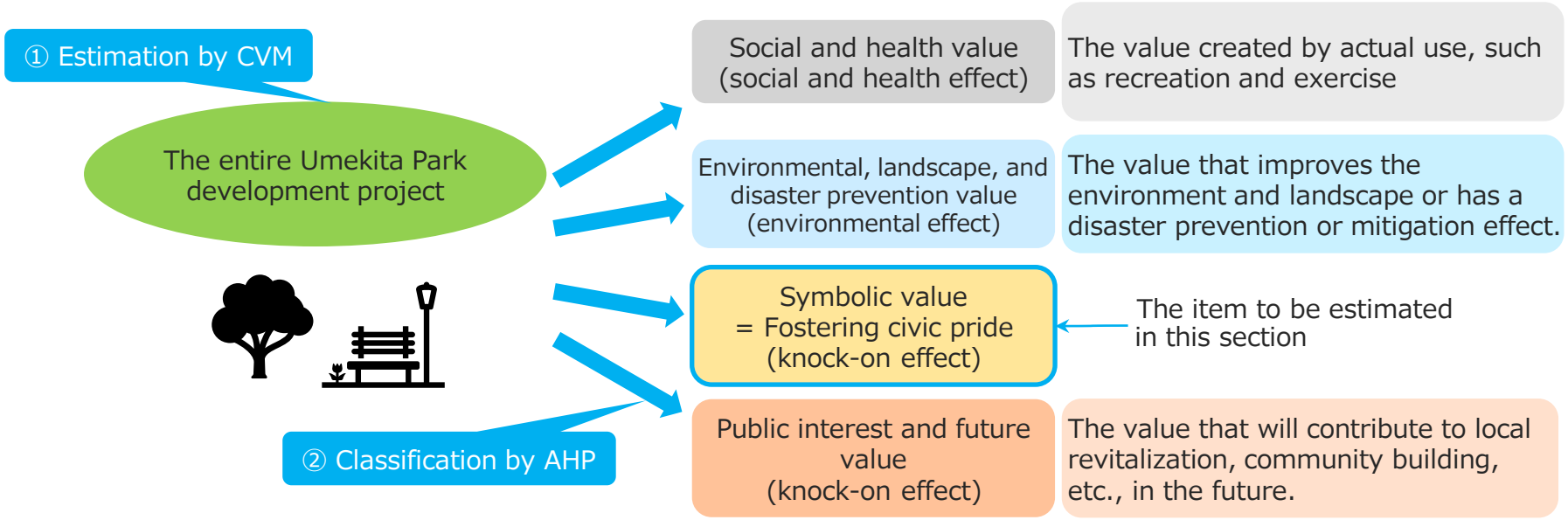
(Source) Created by Japan Economic Research Institute Inc. based on a map on the Urban Renaissance Agency website (https://www.urnet.go.jp/produce/case/umekita/2nd/project2/approach.html)

Fostering of civic pride 1/3

- Fostering civic pride refers to improving a town's character and image, becoming a symbol of the city, and creating citizens' attachment to the community.
- Given the lack of unit values, comparable cases, correlated land price data, or data indicating usage value for the content, we used the contingent valuation method (CVM) to evaluate the park's effect on civic pride as well as ecosystem and biodiversity preservation.
- Specifically, to determine the willingness-to-pay (WTP) of residents for the entire Umekita Park development project, a web-based questionnaire survey (1,100 respondents in total) was conducted among residents of Osaka Prefecture to determine annual benefits.
- However, these benefits also seem to bring values other than the increase in civic pride of the neighborhood residents (referred to in the questionnaire as "symbolic value" to make it easier to understand). Therefore, in the above questionnaire survey, we also conducted an analytic hierarchy process (AHP) and categorized the annual benefits estimated by CVM into four values (see the figure on the next page).

Fostering of civic pride 2/3

Benefits from the entire Umekita Park development project



(Source) Japan Economic Research Institute Inc.

Fostering of civic pride 3/3

- CVM estimates the average WTP per household to be 5,371 yen in Osaka City and 4,454 yen in Osaka Prefecture, respectively. Multiplying these amounts by the number of households in Osaka City and Osaka Prefecture, the estimated annual benefits are 8.4 billion yen in Osaka City and 19.9 billion yen in Osaka Prefecture.
- Furthermore, the results of the AHP analysis showed that the portion of Umekita Park's annual benefits that can be attributed to "symbolic value = fostering civic pride" is 1.6 billion yen for Osaka City and 3.8 billion yen for Osaka Prefecture.
- Assuming that Umekita Park yields these benefits every year during the project period, the following table shows the discounted present value of each value until 2030, 2050, and 2073 (50 years from the partial opening of the park). The discount rate is assumed to be 4%.

Discounted present value of benefits from the entire Umekita Park development project (100 mil. yen)

Osaka City	One year	Discounted present value		
		Until 2030	Until 2050	Until 2073
Total benefit	84.43	463.69	1,370.51	1,822.93
Symbolic value	15.91	87.37	258.23	343.48

Osaka Prefecture	One year	Discounted present value		
		Until 2030	Until 2050	Until 2073
Total benefit	199.36	1,094.89	3,236.10	4,304.39
Symbolic value	37.80	207.61	613.62	816.18

(Sources) Created by Japan Economic Research Institute Inc. based on Kuriyama, Koichi, Takahiro Tsuge, and Yasushi Shoji, “Introduction to the Environmental Valuation,” Keiso Shobo, 2013; and Japan Geographic Data Center, “Osaka Prefecture population and household numbers by municipality–April 2023 Survey.”

Economic knock-on effect 1/4

■ Firstly, we assumed the types of visitors to Grand Green Osaka, their economic activities, and consumption expenditures. Then, we estimated the macroeconomic effects of Grand Green Osaka by measuring their knock-on effects using the Osaka Prefecture Input-Output table.

Overview of economic activities assumed at Grand Green Osaka

Major economic activities		Estimated amount of expenditure	Approaches to estimation
Expenditure in Umekita Park		Expenditure in Umekita Park **= 6.0 bn Yen**	• Estimate the expenditure by visitors to Umekita Park. • Utilize the results of a survey of urban park visitors conducted by the Japan Economic Research Institute, Inc.
Commercial facilities	Inbound tourists' expenditure	Total expenditure at commercial facilities **= 27.8 bn Yen**	• Estimate the inbound tourists' spending at commercial facilities in Grand Green Osaka. • Utilize the total and duty-free sales data in major department stores published in the Japan Department Stores Association's press releases "Duty-free sales and customer trends" and "Nationwide department store sales overview."
	Domestic shoppers' expenditure		• Estimate the annual expenditure at commercial facilities by domestic shoppers and workers. • Utilize Grand Front Osaka's sales in FY2022 before inbound demand fully recovers.
Hotel		Super luxury hotel **= 6.0 bn Yen** Life-style/Upscale hotels **= 8.1 bn Yen**	• Estimate the annual hotel expenditure for the three hotels in Grand Green Osaka as "number of rooms multiplied by unit price per room and occupancy rate." • The average daily rates are assumed based on Hilton's financial statements, etc. The occupancy rate is assumed to be 85%, based on the DBJ Kansai Branch Planning and Research Division's "Luxury hotel market in the Kansai area."
MICE		Expenditure excl. at hotels and commercial facilities **= 2.6 bn Yen**	• Estimate spending by organizers, exhibitors, and participants of MICE events held at Grand Green Osaka. • Assume that the MICE market size will recover to about the same level as in 2019 in the spring of 2025 when the South Building (Conference Center and Waldorf Astoria Osaka) opens.

(Source) Japan Economic Research Institute Inc.

Economic knock-on effect 2/4

Estimation of annual expenditure by visitors to Umekita Park

% of visitors who make purchases on the way to or in urban parks	×	Average amount of expenditure per visit (Yen)	×	Assumed annual number of visitors to Umekita Park (10 thousand people)	=	Expenditure by visitors to Umekita Park (100 mil. Yen)
59.21%	×	1,015.08	×	1,000	=	60.10

Estimation of annual expenditure at commercial facilities of Grand Green Osaka (including inbound tourists)

Total sales of Grand Front Osaka in FY2022 (100 mil. Yen)	×	Grand Green Osaka sales area adjusted by utility ratio for each floor of the building (m^2)	÷	Grand Front Osaka sales area adjusted by utility ratio for each floor of the building (m^2)	×	The reciprocal of (Total sales – Duty-free sales) /Total sales	=	Expenditure at commercial facilities (100 mil. Yen)
423	×	14,580	÷	25,792	×	1.16	=	277.68

Estimation of annual expenditure at hotels in Grand Green Osaka

Classification	Assumed average daily rate (Yen)	×	Assumed occupancy ratio	×	Days per year	×	Total number of rooms	=	Expenditure at hotels (100 mil. Yen)
Super luxury hotel	76,731	×	85.4%	×	365	×	252	=	60.27
Life-style/upscale hotels	32,861	×	85.4%	×	365	×	790	=	80.92

Economic knock-on effect 3/4

Estimation of annual expenditure by organizers, exhibitors, and participants of MICE in Grand Green Osaka

Total expenditure in MICE (100 mil. Yen)	–	Duplicated expenditure at hotels	–	Duplicated expenditure at commercial facilities	=	Expenditure in MICE excl. at hotels and commercial facilities (100 mil. Yen)
32.61	–	1.66	–	4.93	=	26.02

(Source) Estimation by Japan Economic Research Institute Inc. based on Grand Front Osaka "Grand Front Osaka 10th anniversary," press release on 25 April 2023, the Ministry of Land, Infrastructure, Transport and Tourism "Utility ratio table for each floor of the building" (https://www.mlit.go.jp/common/001206720.pdf), press releases from the Japan Department Stores Association "Duty-free sales and customer trends" and "Nationwide department store sales overview", Hilton Worldwide Holdings Inc. "Hilton Reports Fourth Quarter and Full Year Results", February 7, 2024 (https://ir.hilton.com/~/media/Files/H/Hilton-Worldwide-IR-V3/quarterly-results/2024/q4-2023-earnings-release.pdf), the Japan Tourism Agency "Survey on expenditures by MICE" March 2021 (https://www.mlit.go.jp/kankocho/seisaku_seido/kihonkeikaku/inbound_kaifuku/mice/corona_henka/content/001399873.pdf), the Japan Tourism Agency "Promotion and attraction of MICE" June 2022 (https://www8.cao.go.jp/okinawa/4/kokusaikaigi/25/shiryou4.pdf), the Japan National Tourism Organization (JNTO) "International Conference Statistics"

Economic knock-on effect 4/4

- Based on the estimated consumption expenditure, we conducted an input-output table analysis to assess the knock-on effects of new final demand in Osaka Prefecture, which was 63.9 billion yen per year.
- Assuming that additional final demand generates these knock-on effects every year during the project period, and assuming a discount rate of 4%, the same as in the "Manual for Cost-Benefit Analysis of Large-Scale Parks" by MLIT, the discounted present value is 332.4 billion yen by 2030, 1.0463 trillion yen by 2050, and 1.4024 trillion yen by 2073, the 50th year after the opening.

Economic knock-on effect on Osaka prefecture from the new final demand created by Grand Green Osaka

	Induced production (100 million yen)			Induced employment
		Gross value added		
			Employee income	
Total knock-on effect	639.07	407.81	194.66	5,985.77
1st knock-on effect	535.93	340.12	167.39	5,305.40
2nd knock-on effect	103.14	67.69	27.26	680.37

Discounted present value of economic knock-on effect from the new final demand

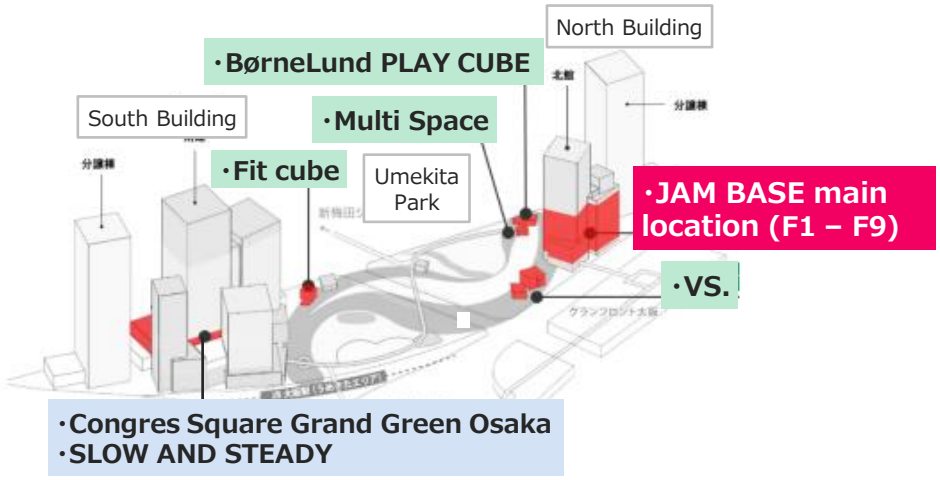
	One year (100 million yen)	Discounted present value (100 million yen)		
		Until 2030	Until 2050	Until 2073
Economic knock-on effect on Osaka prefecture	639.07	3,324.32	10,462.89	14,024.46

(Source) Estimation by Japan Economic Research Institute Inc. based on Osaka Prefecture "2018 Updated Input-Output Tables for Osaka Prefecture" 27 October 2023 (https://www.pref.osaka.lg.jp/o040090/toukei/sanren/tool.html)

Stimulating innovation 1/6

- The Umekita Redevelopment Project Phase I Area "Grand Front Osaka" has established a hub for intellectual and creative activities, centering on a core named Knowledge Capital. This hub functions as a platform for stimulating innovation.
- As an enhancement and development of these efforts, the goal of Grand Green Osaka is to create a world-class business environment and a high-quality residential environment through the accumulation of multiple functions that will induce a variety of uses and create liveliness while coordinating and complementing core functions within the green spaces.
- The core facility, JAM BASE, aims to generate ideas and to stimulate innovation by bringing together diverse people, summarized by the statement: "Various ideas and innovation will come out of this place." The concept aims to stimulate diverse innovation by the spirit of challenge and the openness to accept new things with interest, characteristics typically associated with Osaka.

Stimulating innovation 2/6



Location	Category	Facility
North Park	Cultural experience facility	VS.
North Park	School and café for family	BørneLund PLAY CUBE
South Park	Joggers’ locker room, fitness studio, café	Fit cube
South bld. F4	MICE facility	Congres Square Grand Green Osaka
South bld. F4	Health support facility for office workers	SLOW AND STEADY

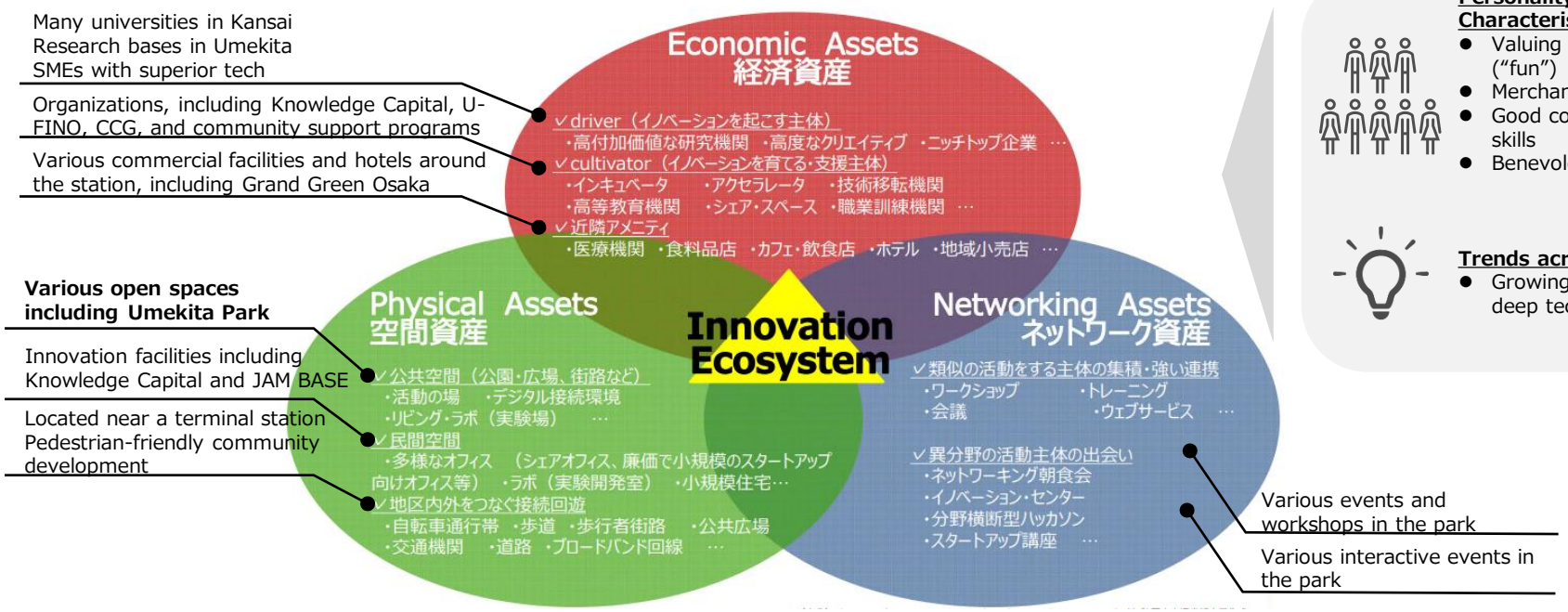
(Source) Created by DBJ group based on Osaka City “Master plan for city planning of Osaka Station North District (July 2004)” (https://www.city.Osaka.lg.jp/osakatokei/page/0000561440.html), Osaka City website (https://www.city.osaka.lg.jp/osakatokei/page/0000005308.html), the Osaka Station Surrounding Area Committee of the Urban Renaissance Emergency Development Council Meeting for the Osaka Station Vicinity and the Vicinity of Nakanoshima and Midosuji “Urban Development Policy for the Second Development Zone in the Umekita Area (March 2015)” (https://www.city.osaka.lg.jp/osakatokei/page/0000305317.html), Press releases from the joint venture for the Grand Green Osaka project on 28 September 2023 and 29 May 2024)

Stimulating innovation 3/6

- According to a Brookings Institution report, "The Rise of Innovation Districts“ (2014), “innovation districts" that generate innovation require three elements: economic assets, physical assets, and network assets.
- A fair evaluation of the Umekita Redevelopment Project Area, including Grand Green Osaka, is that it appears to have all three of those elements in abundance.
- Regarding the network assets element, it is essential to implement programs, encourage participation, and create and deepen connections among stakeholders. We believe that the human characteristics of Osaka and the Kansai region, such as the merchants’ spirit and the valuing of *omoshiroi* (“fun”), could influence the concentration of diverse human resources and the promotion of encounters and cooperation.

Stimulating innovation 4/6

The three elements of “innovation districts" and the characteristics of the Umekita area



(Source) Created by City Bureau of the Ministry of Land, Infrastructure, Transport and Tourism based on Brookings Institution’s “The Rise of Innovation Districts” (2014).

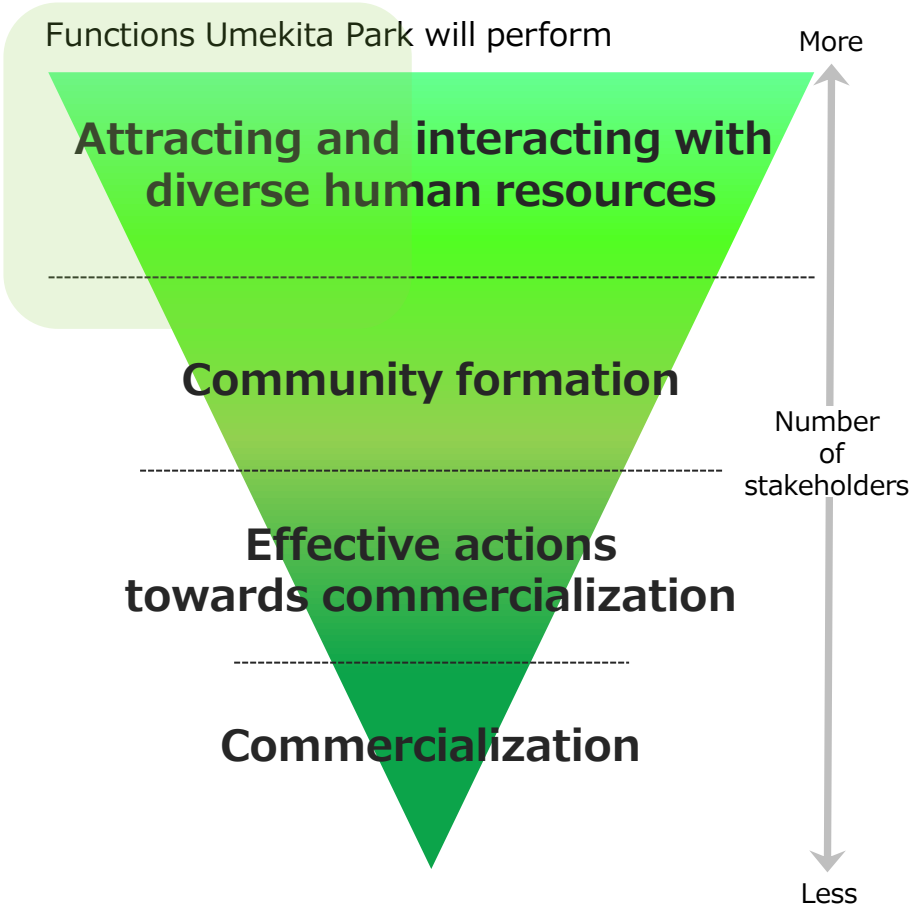
(Source) Created by DBJ Group based on City Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, “Roundtable Conference on Urban Diversity and Innovation.”

Stimulating innovation 5/6

- While various factors may contribute to stimulating innovation, the formation of open innovation through "open space" and "community formation" is assumed to be a typical pattern in Grand Green Osaka.
- Of these, we envisage Umekita Park attracting and interacting with diverse human resources and promoting community formation as an open space in the downtown. We plan to study the park's diversity further after its completion.
- However, measuring diversity in the limited area of Grand Green Osaka is not easy, and we will continue to study the measurement method.

Stimulating innovation 6/6

Draft flowchart of innovation formation in Grand Green Osaka



(Source) DBJ group

Draft plan for evaluating contribution to stimulating innovation by Umekita Park

(i) Understanding the diversity of visitors to the Umekita Phase II area

(ii) Understanding the diversity of visitors at innovation facilities and events

(iii) To understand whether the participants in (ii) above could interact with people with different attributes.

(iv) Understanding whether the participants in (ii) above were exposed to unknown technologies.

(v) A questionnaire will be sent to participants in (ii) above to understand changes in “thinking and behavior.“

(vi) Hearings on collaboration effects, etc., with businesses in the Umekita Phase II area

Conclusion

- In this study, we are attempting to estimate and evaluate the effects of the green spaces in the Umekita Phase II Area "Grand Green Osaka" by creating a logic model and setting up evaluation methods based on hearings from various sources and experts' opinions.
- We evaluated Grand Green Osaka under certain assumptions since it will open partly in September 2024. We believe we can obtain more precise results by re-evaluating the data obtained after the business opens.
- In Japan, the City Bureau of MLIT is promoting the Urban GX as a significant policy, and there is a movement to establish a certification system for urban green space. In the future, urban development focusing on green space will increase not only in the Osaka area and surrounding areas but also in Japan.
- Although we can refine the estimates and evaluations in this study further in the future, we would be happy if we could contribute to the future discussion in Japan as a pioneer in quantifying the effects of green space in light of the trends described above.
- If we can reveal the impact of green space on innovation through ongoing research after the project's opening, we can recognize the Urban GX initiatives as even more meaningful.
- Quantifying social benefits began in healthcare, where quantitative analysis is possible, and is spreading to urban development. By quantifying the benefits of green space and sharing the results with the public and private sectors, it is possible to lead to new initiatives in urban development.
- Once again, we hope this survey will be jointly and co-created with many people, as we intend to deepen further the study based on their opinions and efforts.

Prospects for the study

- We intend to collaborate and co-create further studies with various stakeholders in the public and private sectors.
- As mentioned above, we conducted estimates and evaluations based on certain assumptions. Therefore, we assume that after the opening of Umekita Park, we will accumulate actual data on social benefits and reexamine evaluation methods.
- It is also helpful to quantify the effects of green space in urban development throughout Japan.
- One idea for utilizing the quantification of green space effects is to create a logic model for urban green space and have a dialogue between the public and private sectors, which could lead to "Pay For Success (PFS)" and "Social Impact Bond (SIB)" initiatives. Furthermore, utilizing private-sector know-how in the operation of urban green spaces could improve their attractiveness and contribute to the formation and maintenance of high-quality urban green spaces.
- In Japan, discussions on natural capital and biodiversity are becoming more active. Since urban green space can contribute to them, we would like to share the effects of green space widely by actively disseminating information on this survey from the above perspective.
- As for the fusion center of green space and innovation, we hope that private companies and citizens will actively participate and form a virtuous circle to promote innovation as the quantification of the effects progresses.
- In the medium term, in conjunction with the national certification system and other developments, initiatives will emerge to utilize the results of quantifying social effects in financing the Urban GX. We want to continue our efforts to further promote the Urban GX initiatives by promoting the refinement of the logic model and evaluation, which will lead to the further promotion of Urban GX initiatives.

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