Asia-Pacific
Economic Cooperation

APEC Low-Carbon Town Indicator System Guideline

First Edition

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APEC Low-Carbon Model Town (LCMT) Project - Phase 6

Produced by
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The Concept of the Low-Carbon Town in the APEC Region

Sixth Edition

APEC Low-Carbon Town Indicator System

Contents

APEC Low-Carbon Town Indicator System Evaluation Sheet [Microsoft Excel File]

1. Background and Objective

The APEC Low-Carbon Model Town (LCMT) project was initiated in 2011 and has carried out feasibility studies (hereafter 'F/S') in five case towns up to now. We have also been working on the development and refinement of the 'Concept of the Low-Carbon Town in the APEC Region' (hereafter 'concept') through reflecting the results of F/S.

As there are various low-carbon measures in the concept, approaches to develop a low-carbon town may differ among individual economies. Therefore, the LCMT Task Force (TF) established the APEC Low-Carbon Town Indicator (LCT-I) System, a self-assessment tool, in order to assess and monitor the progress of each low-carbon town development project. The LCT-I System was designed to be as simple as possible for the users to easily carry out an assessment of low-carbon town projects with various scales, characteristics and stages of progress. After a basic survey in 2013, trial evaluations were also conducted in 2015 with the help of previous LCMT-case towns. The existing assessment systems, such as Comprehensive Assessment System for Built Environment Efficiency (CASBEE), were referred and partially included in the LCT-I System. The draft of LCT-I System was reported and endorsed in the 50th APEC Energy Working Group (EWG) Meeting in December 2015.

The utilisation of the LCT-I System is expected to further promote low-carbon efforts at the town level and improve the management of CO_2 emissions. The ultimate goal is to increase the number of low-carbon towns within APEC economies.

2. Outline of the LCT-I System

2-1. Overview of the LCT-I System

(1) Characteristics of the LCT-I System

The objective of the LCT-I System is to further promote low-carbon efforts at the town level and control CO_2 emissions. It was designed to be as simple as possible in consideration of user friendliness. In addition, the LCT-I System is expected to be used as an indicator that reflects the circumstances of each economy and the characteristics of the project.

Table 1: Features of the LCT-I System

① Simple and easy-to-understand. ・The LCT-I System is intuitive and easy-to-understand, utilising existing statistical data where possible. ・The LCT-I System seeks to evaluate both the individual assessment area, as well as the whole low-carbon town project, as a comprehensive indicator system. ② Reflects the circumstances of each economy and the characteristics of the project. ・The LCT-I System reflects the economic circumstances of each economy and the characteristics of the low-carbon town project. It is not designed to obstruct sustainable development. ・The LCT-I System can grasp and visualise the degree of achievement over time in each stage of conceptualisation, planning, implementation and maintenance. ③ The LCT-I System is developed based on the existing assessment indicators and global trends. ・The LCT-I System reflects global trends, such as smart community infrastructure assessment indicators (Technical Committee (TC) 268 developed by the Organization for International Standardization (ISO)) and OECD activities, while using the existing indicators, including CASBEE, as reference.

(2) Merits of Utilisation of the LCT-I System for Each Economy

The following points can be expected as merits of utilising the LCT-I System.

・Users can grasp the advantages and disadvantages of the low-carbon town development project in each assessment area, and the results of the LCT-I System assessment are easy to be reflected in the implementation plans (establishment of roadmap, launch of a specialised department, prioritisation of measures, budget planning, etc.). ・The LCT-I System is a simple self-assessment system. ・The LCT-I System can be used in each phase, such as conceptualisation, planning, implementation, maintenance and management to judge the progress of the project. The assessment results will help the users improve their measures, budget, etc. ・The LCT-I System identifies the current status of the low-carbon town projects, so information sharing in the economy will be facilitated.

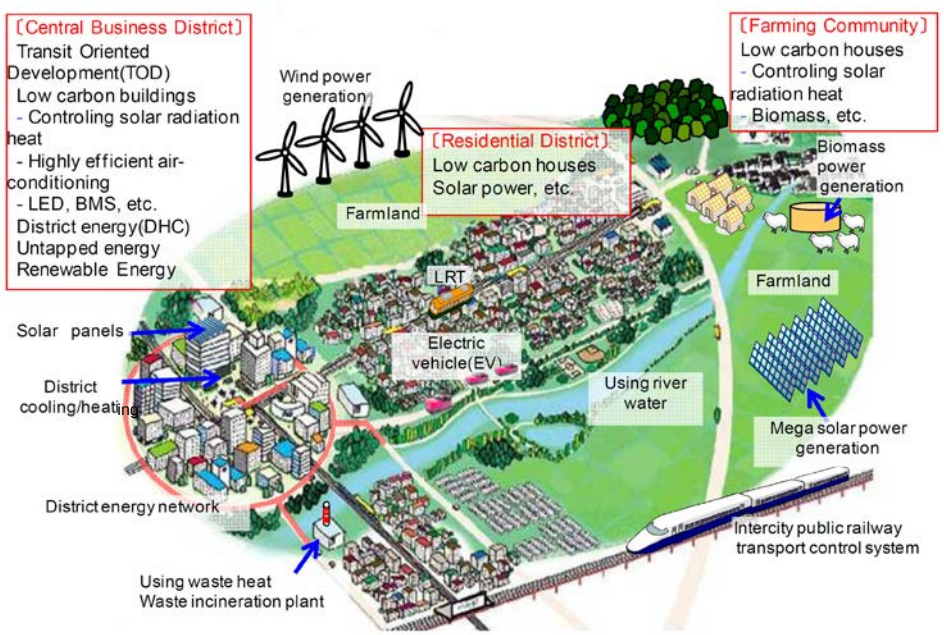
・Efforts to develop low-carbon towns can be visualised and used as a public relations tool to attract domestic and international developers, investors and companies.
・In the future, the results of the LCT-I System assessment can be a provision for low-interest financing by financial agencies.

(3) Targeted Scale of Space and Assessment Areas

The town classifications and assessment areas targeted in the LCT-I System are described below.

- Designed to conform to the concept.
- The targeted towns are classified into four types: 1. urban (Central Business District: CBD), 2. commercially oriented town, 3. residentially oriented town, and 4. rural (village or island).
- In most cases, the assessment areas include buildings, transportation systems and district infrastructure within the low-carbon town boundary (project boundary or administrative district)

Figure 1. Image of Low-Carbon Town



Source: based on Special Report SR-79,2008, National Institute for Environmental Studies

Table 2: Characteristics of a Town

Type of Town			Characteristics of Town			Infrastructure Development	Laws and Regulations
Symbol	Type		Size	Population Density	Land Usage		
I	Urban	CBD	100ha-	High	Mixed	Sufficient	Sufficient
II		Commercially/ Industrially Oriented Town	-100ha	Middle to High	Mixed		

III		Residentially Oriented Town		Middle	Mainly Housing	Insufficient	Insufficient
IV	Rural	Village Island		Low	Farming Fishing Resort		Limited

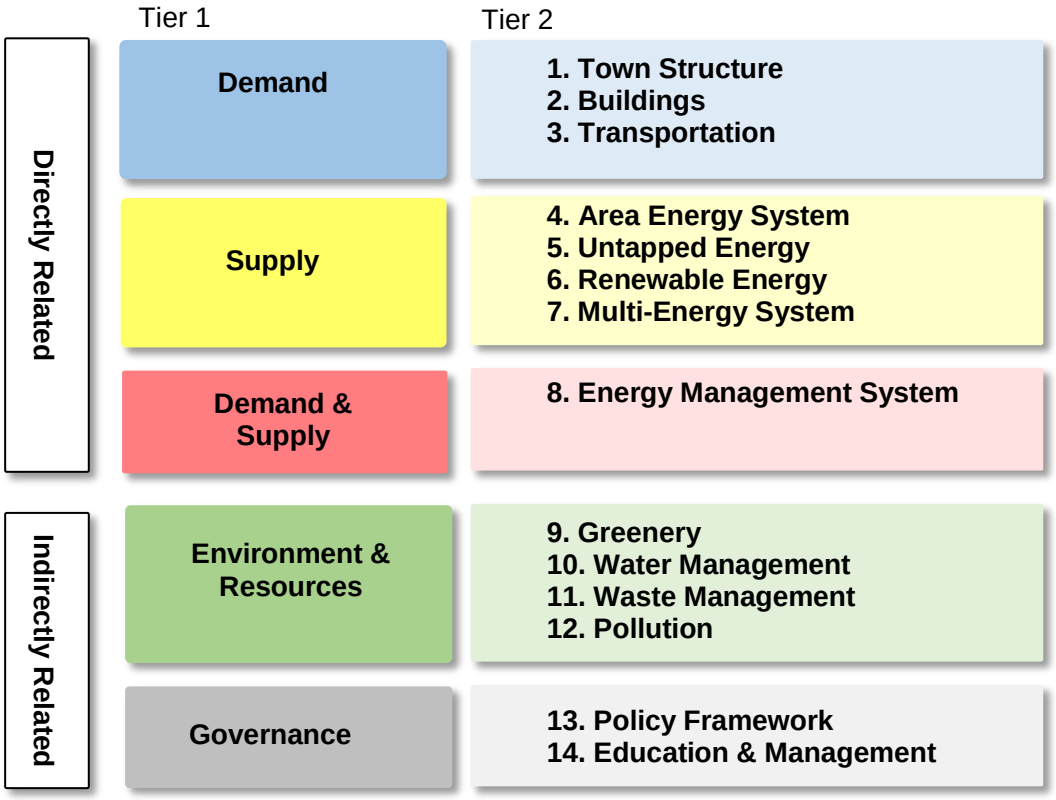
Source: Concept of the Low-Carbon Town in the APEC Region, Fourth Edition

(4) Composition of Assessment Areas

As the low-carbon measures addressed in the concept were originally designed from the energy perspective, they were first categorised into two main categories: measures 'directly related' to energy usage; and measures 'indirectly related' to energy usage.
In directly related measures, measures concerning demand, supply, and both demand & supply were included as Tier 1 items. In indirectly related measures, aspects of 'Environment & Resources' and 'Governance' were included. Though measures in these two indirectly related Tier 1 items do not concern energy usage, they are very important elements in developing low-carbons.

- Assessment targets are comprised of five major items (Tier 1) and 14 mid-level items (Tier 2).
- In Tier 2, assessment indicators and assessment criteria to create a multi-level Tier 3 are set.
- Items in existing assessment indicators, such as CASBEE, are referenced and included.

Figure 2. LCT-I Assessment Areas



(5) Scoring Criteria and Assessment Method

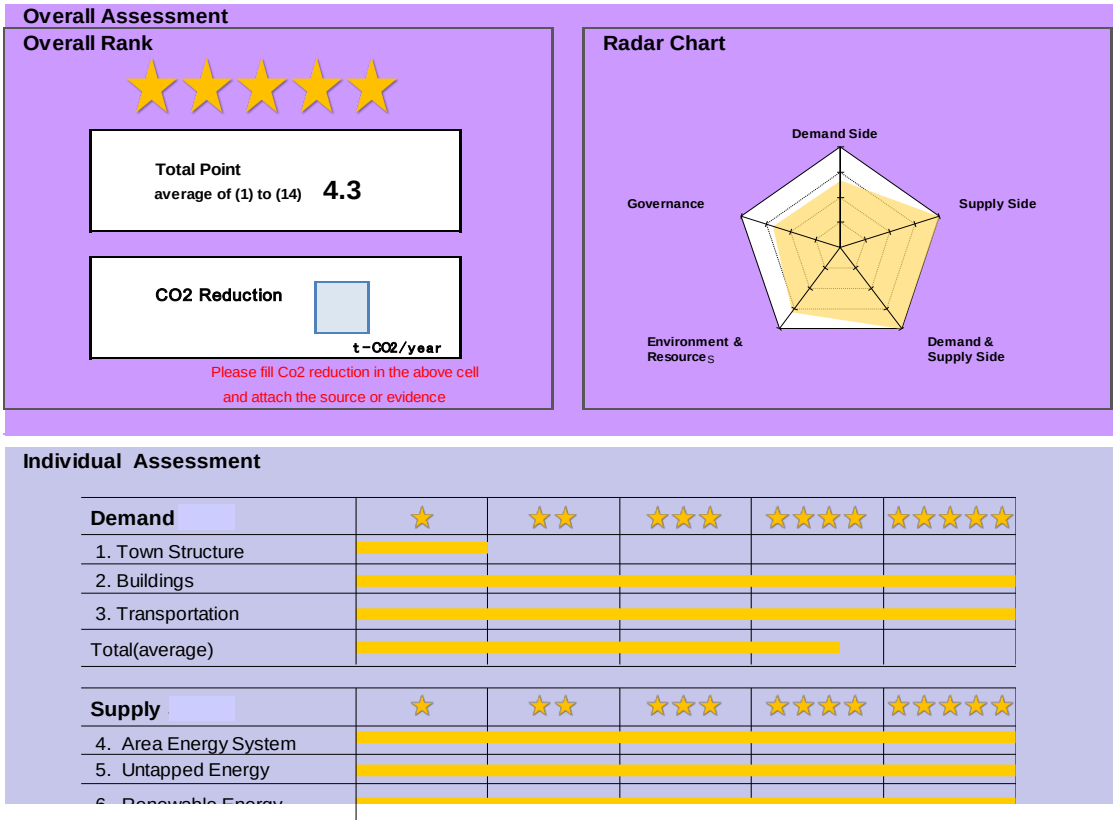
Scoring criteria is set according to the following concept.

- Achievement level is evaluated by a five-point scale: ★, ★★, ★★★, ★★★★ and ★★★★★. ★★★ is the standard value.
- However, depending on the indicator, a three-point scale (★, ★★★ and ★★★★★) and a four-point scale (★, ★★, ★★★★ and ★★★★★) may be applied.
- In cases without plans, efforts, systems or criteria, or in cases where the numerical value cannot be measured, an evaluation is not given (no ★ awarded).
- Regarding the quantitative assessment area, calculation is carried out in reference to the standards of each economy and international standards.

(6) Assessment Method

- Local and national governments can use the LCT-I System for self-assessment.
- The regulations and incentives can be weak or strong depending on the situation of the users. A reference to a specific regulations or incentives will help clarify the level of stringency.
- The assessment results will appear as ‘overall rank’, ‘radar chart’ and ‘individual assessment’, which will help identify the achievement level of the project and areas to be improved for the realisation of a low-carbon town.

Figure 3. Image of the Assessment Results Sheet



(7) How to Use the Assessment Results

After assessment by the LCT-I System, the following utilisation examples can be considered.

- For example, by publishing the results of LCT-I assessment on their websites, APEC economies can share information on best practices in order to further facilitate the widespread dissemination of low-carbon towns.
- The LCT-I assessment result of each low-carbon town project will be compiled by each economy and shared with Asia Pacific Energy Research Centre (APERC) as a reference if agreed.
- Progress can be regularly reported at the LCMT Task Force Meeting and other opportunities.
- It is desirable that a local or national government review their low-carbon town development project and improve it with necessary measures identified in the result of the LCT-I assessment.
- Periodic assessment is recommended as the LCT-I evaluation can show the improvement of the low-carbon development.
- It is ideal to have an incentive scheme, such as preferential interest rate or government subsidy, is given to the low-carbon town projects which show excellent LCT-I results.
- A local or national government can outsource the assessment to a third party (e.g. consultant), if unable to assess the project itself.

2-2. Concept of Individual Areas

The LCT-I System consists of a total of 14 Tier 2 items. The background information and low-carbon efforts of these Tier 2 items are explained as below.

Tier1	Demand
Tier 2	1.Town Structure
Background	・ The amount of CO_2 emissions increased due to unplanned urban development and chronic traffic congestion. ・ The amount of CO_2 emissions increased due to disorganised development in the suburbs and extended travel distance by automobile. Moreover, increase in maintenance cost of public infrastructure, such as road/water supply and sewage, due to urban sprawl is also an issue. ・ Therefore, the establishment of a town structure that minimises transfer itself and guidance for Transit Oriented Development (TOD) are needed. ・ Concentration of urban functions and overcoming car-dependency will contribute to the improvement of town quality, including punctuality, comfort and control of CO_2 emissions.
Policies to Create a Low-Carbon Town	・ Establishment of a town structure that minimises the need for transport. ・ Control of town suburbanisation and sprawl. ・ Promotion of the use of public transportation in daily life, such as commuting and shopping. ・ Shortening of transit distance and time by locating residential areas adjacent to work areas. ・ Promotion of effective land use (utilisation of maximum floor-area ratio). ・ Multiple land use (concentration of functions of residence, business, commerce, medical care). ・ Development and land use considering traffic hubs, such as railroad stations and bus stations.

Tier1	Demand
Tier 2	2. Buildings
Background	・ The ratio of the consumer sectors (house/business) exceeds 30% in the world energy demand. Moreover, more than half of the energy

	consumption in household/business area is consumed by air conditioners/heaters and hot-water supply. * ・ Countermeasures for both the building itself and equipment are needed to reduce this energy consumption. Moreover, consideration of not only of new buildings, but also of existing buildings (renovation, repair, etc.) is needed. ・ Some economies have prepared certification systems and guidelines for low-carbon buildings and encourage efforts towards low-carbon buildings, such as energy savings, eco materials and extended life. * Source of numerical values: Energy White Paper 2014, Ministry of Economy, Trade and Industry
Policies to Create a Low-Carbon Town	・ (Hardware Countermeasures) Use heat insulation, energy-saving equipment and natural energy to reduce energy consumption (heaters and air conditioners). ・ (Software Countermeasures) Prepare a certification system and guidelines to standardise energy-saving buildings.

Tier 1	Demand
Tier 2	3. Transportation
Background	・ The ratio of the transportation department is approximately 30% in the world energy demand. ・ Compared with the CO_2 emissions from public transportation (bus, railway), CO_2 emissions from the private automobiles are higher. In recent years, the ratio of private vehicles ownership in developing economies has rapidly increased, and chronic traffic congestion has become an issue. ・ Traffic congestion is considered to cause lower fuel consumption efficiency, as well as economic loss, health damage and social loss due to traffic accidents, etc. ・ Therefore, promoting public transportation by controlling the use of private vehicles and actively utilising low-carbon transportation methods are needed. Source: Energy White Paper 2014, Ministry of Economy, Trade and Industry. CO_2 emissions by each method were; walking 0, train 22, bus 56, private automobiles 147 (g-CO_2/ person/ km in 2013), Ministry of Land, Infrastructure, Transport and Tourism)
Policies to	・ Develop traffic nodes convenient to transit to the public

Create a Low-Carbon Town	transportation. ・ Introduce car sharing, park-and-ride, etc. as comprehensive transportation countermeasures based on public transportation. ・ Introduce pioneering public transportation methods, such as Bus Rapid Transit (BRT) and Light Rail Transit (LRT), as means of mass transportation. ・ Introduce low-carbon vehicles, such as Electric Vehicles (EVs), Plug-in Hybrid Vehicles (PHVs), Hybrid Electric Vehicles (HEVs), Fuel Cell Vehicles (FCVs), natural gas vehicles and diesel vehicles. ・ Implement transportation demand management (TDM) utilising Information and Communication Technology (ICT). ・ Develop roads, such as highways and interchanges, to control traffic congestion and realise smooth traffic flow. ・ Promote eco driving. *Regulation of air pollution contaminants, such as SPMs and exhaust gas, is assessed in 12.1 Air Pollution.

Tier1	Supply
Tier 2	4. Area Energy System
Background	・ As methods to supply cooling water, steam or hot water to facilities, there are cases where each building has an individual air conditioning/heating system. There are also cases where cool/warm air is supplied to multiple buildings by a centralised district heating and cooling system (DHC), district heating system (DH) or district cooling system (DC). ・ For the latter case, as the supply system is integrated in one location, energy is utilised efficiently, and energy saving is enhanced. ・ Moreover, since space is not required to install heat-source equipment in each building, effective use of spaces, such as the basement and rooftop, is possible. ・ Regarding energy sources, renewable and untapped energies, such as river water heat, sewerage water heat and biomass energy, can be used. ・ In Europe, a network of hundreds of kilometres of pipeline is maintained by a district heating supply system using untapped energy, and most of the heat demand of cities is met. ・ Even though Area Energy Management System is technically

	possible in any type of town, its business feasibility depends on the town structure and density.
Policies to Create a Low-Carbon Town	・ Introduce district energy systems such as DHC/DH/DC.

Tier 1	Supply
Tier 2	5. Untapped Energy
Background	・ Untapped energy refers to sources that have not been used previously, such as exhaust heat from sewage and factories. By using these energy sources, energy savings can be expected. ・ Moreover, this will reduce the use of fossil fuels, contributing to a reduction in CO_2 emissions. ・ On the other hand, it is understood that untapped energy sources are widely distributed and sometimes located far away from the demand site, and the cost effectiveness often remains as an issue. Heat pump systems are recommended as an efficient technology.
Policies to Create a Low-Carbon Town	・ Utilisation of exhaust heat from sewage heat, heat from subway/ underground shopping area, etc.

Tier 1	Supply
Tier 2	6. Renewable Energy
Background	・ Renewable energy largely contributes to a reduction in greenhouse gases as a substitute for fossil fuels. It can be repeatedly used with less resource depletion, unlike fossil fuels. Therefore, the introduction of renewable energy is promoted. ・ Power generation using renewable energy can greatly reduce CO_2 emissions throughout its life cycle, including its used in building and discarding the facilities. * According to estimation by International Energy Agency (IEA), the contribution of renewable energy is estimated to be 17 % when the amount of world greenhouse gas emissions is reduced by half in 2050 compared to 2005 levels.

Policies to Create a Low-Carbon Town	・ Introduction of renewable energies, such as solar, wind, small-scale hydropower and biomass.

Tier 1	Supply
Tier 2	7. Multi-Energy System
Background	・ It is important to take energy-efficient electricity and heat supply measures considering the characteristics of energy consumption in a building from air conditioning, heating, lighting, hot-water supply, etc. ・ Combined Heat & Power (CHP) or cogeneration is a system that generates power and supply heat simultaneously . Overall energy efficiency, including power generation and heat supply, exceeds 70%, which is higher than in conventional systems (the overall efficiency of a thermal power plant is approximately 40% according to Advanced Cogeneration and Energy Utilization Center Japan (A.C.E.J)) ・ The amount of conventional energy consumption can be reduced by integrated higher energy efficiency and the total energy cost can also be reduced. Moreover, reduction of the amount of power purchased during peak demand is an advantage.
Policies to Create a Low-Carbon Town	Introduction of a highly energy-efficient system. In addition to the CO_2 emission reduction effect, an energy-saving effect and cost-reduction effect can be expected. Furthermore, electric heat energy supply in cases of emergency can be expected as a distributed power source system.

Tier 1	Demand & Supply
Tier 2	8. Energy Management System
Background	・ For the effective use of energy and the stable supply of renewable and untapped energy, an energy management system (EMS) is required. ・ Visualisation of electric power consumption and effective use of electricity are possible by the introduction of an EMS for individual buildings and others, such as an Area Energy Management System (AEMS), Home Energy Management System (HEMS), Building

	Energy Management System (BEMS) and Factory Energy Management System (FEMS). ・ If a smart grid system using information and communication technology (ICT) is installed, the distribution power source system and demand from customers together can be viewed. Moreover, high efficiency, high quality and high reliability power supplies are possible. ・ The smart grid system can be introduced not only in areas not connected with the power grid but also in areas being developed. ・ The smart grid system is cutting edge technology, but an essential element to realise low-carbon towns. Introduction of the smart grid system is highly recommended.
Policies to Create a Low-Carbon Town	・ Establishment of a system to operate the EMS ・ Introduction of EMS in buildings, households and factories ・ Introduction of AEMS to control energy usage in a wider area with multiple buildings, such as offices, shops, and houses. ・ Understanding and controlling demand and supply by utilising ICT.

Tier 1	Environment & Resources
Tier 2	9. Greenery
Background	・ The exhaust heat from various human activities in town life, the surfaces of buildings and asphalt increase air temperature in urban areas. The temperatures in urban areas are relatively high (heat island phenomenon) in comparison to the surrounding suburbs. ・ Greenery area works to control the surrounding temperature by evapotranspiration. Making rooftops and wall surfaces greenery spaces is also effective. ・ Moreover, providing continuous shade area contributes to wind paths and cool-spot formation. ・ Greenery contributes to the absorption of CO_2 emissions.
Policies to Create a Low-Carbon Town	・ Increase greenery. ・ Create continuous shade area to make wind paths. ・ Conserve existing green spaces and nature.

Tier 1	Environment & Resources
Tier 2	10. Water Management

Background	・ Due to population increases and economic activities, the amount of wastewater from daily life and factories has been increasing in many cities, but development of drainage treatment facilities have not kept up with the demand. ・ It is difficult for a town to ensure budget and land for treatment facilities, as a large amount of energy is required for drainage treatment, and maintenance of drainage treatment facilities is not easy. ・ For the above described reasons, efforts to reduce the volume of water usage regardless of whether a household or business, are needed. ・ Creation of a system for using rainwater is helpful. Water usage and energy for recycling water can be reduced by installing individual rainwater-use systems and joint intermediate water systems for the facilities in the same area.
Policies to Create a Low-Carbon Town	・ Reduction of water use. ・ Promotion of water recycling.

Tier 1	Environment & Resources
Tier 2	11. Waste Management
Background	・ The waste treatment system has not been established in many cities. ・ In these cities, controlling the amount of discharged waste, garbage separation, recycling, etc., are not thoroughly carried out in most cases and is usually buried in suburban areas. As a result, bad odours spread, and methane gas (CH_4) is released. CH_4 is considered to have approximately 25 times larger effect on the global warming in comparison to CO_2. ・ Efforts to incorporate the 3Rs (Reduce, Reuse and Recycle) are important to create a society that effectively uses energy and the limited resources of the earth. ・ Though waste management is very important in reducing CO_2 emissions, it is categorised as a indirectly related measure in the LCT-I System as it is not directly linked with energy efficiency.
Policies to Create a Low-Carbon Town	・ Promotion of 3R activities.

Tier 1	Environment & Resources
Tier 2	12. Pollution
Background	・ Air and water pollution are caused by town activities, but the pollution sources may be different from the place that is suffering from the pollution. Thus, in some cases, it is difficult to specify the pollution source. While it is easy to identify the source and pollution level of soil pollution, as it is caused in a specified area, the groundwater pollution may spread over a wide area. ・ Appropriate treatment of air and water pollution before they become environmental pollution is desirable. If pollution is not treated with an appropriate measure, more energy and resources (cost) will be needed to remedy the problem later. ・ Efforts at the local and national levels are necessary, since polluted areas are usually wider the area managed by a town or a project. ・ Furthermore, with contaminants, such as SPMs from factories and vehicles (particularly diesel vehicles), becoming an issue in neighbouring economies in recent years, each economy must take actions with common awareness.
Policies to Create a Low-Carbon Town	・ Setting environmental standards. ・ Efforts to achieve the standards. ・ Reinforcement of regulations and penalties (e.g. Exhaust gas regulations, etc.)

Tier 1	**Governance**
Tier 2	13. Policy Framework
Background	・ It is difficult for the private sector alone to establish a low-carbon and sustainable society through the efficient use of energy, low-carbon transportation and construction. The government's strong initiatives and aggressive efforts are essential. ・ The introduction of technology (hardware) and software, such as regulations, control, political measures and partnerships, is needed to promote various efforts related to the creation of a low-carbon town.
Policies to Create a Low-Carbon Town	・ Implement low-carbon measures, project planning and securement of a budget (software countermeasures). e. g. Preparation of a low-carbon guidebook, global warming countermeasures, Life Continuity Planning (LCP), Business Continuity Planning (BCP), educational systems and campaigns.

	・ For sustainable development, develop disaster response and promote development without environmental degradation (hardware countermeasures). e. g. Conservation of natural environment to prevent blackouts and other damage that can occur as a result of natural disasters.

Tier 1	**Governance**
Tier 2	14. Education & Management
Background	・ In order to create the sustainable low-carbon town efficiently, the roles to be played by both public and private sectors should be clarified. In addition, residents must have a high awareness of a low-carbon town, and their involvement is necessary. ・ Schools, households and companies should promote education to connect each resident's daily life activities to energy-saving activities. ・ Moreover, information sharing through energy-related events held by local governments and area management organisations will help raise the awareness of the residents and companies in the area.
Policies to Create a Low-Carbon Town	・ Enlightenment activities. ・ Environment education (environment studies, eco driving, etc.), ・ Establishment and operation of area management organisation.

List of Assessment Items

Tier 1	Tier 2	Tier 3
Demand	1. Town Structure	1. Adjacent Workplace and Residence 2.Land use 3.TOD
	2. Buildings	1. Energy Saving Construction 2. Green Construction
	3. Transportation	1. Promotion of Public Transportation 2. Improvement in Traffic Flow 3. Introduction of Low Carbon Vehicles 4. Promotion of Effective Use
Supply	4. Area Energy System	1. Area Energy
	5. Untapped Energy	1. Untapped Energy
	6. Renewable Energy	1. Renewable Energy
	7. Multi-Energy System	1. Multi Energy
Demand & Supply	8. Energy Management System	1. Energy Management of Building / Area
Environment & Resources	9. Greenery	1. Securing Green Space
	10. Water Management	1. Water Resources
	11. Waste Management	1. Waste Products
	12. Pollution	1.Air 2. Water Quality 3. Soil
Governance	13. Policy Framework	1. Efforts toward a Low-Carbon Town 2. Efforts toward Sustainability
	14. Education & Management	1. Life Cycle Management

3. Assessment Criteria

3-1. Demand

1. Town Structure

1.1. Adjacent Workplace and Residence

Achieve concentration (compactisation) of urban functions by locating workplaces and residences adjacent to each other.

1.1.1. Residential Use and Non-residential Use

Assess the ratio of residential use and non-residential use to the total floor area of the entire building.

★	15% or less
★★	—
★★★	15% to 30%
★★★★	—
★★★★★	30% or more

■ Remarks

- It is easier for people to commute to work place or school if workplaces and residences are adjacent to each other. People to commute to work or school, and carry out daily activities such as shopping by of short-distance transportation including walking, bicycle, as well as by bus, train, etc.
- All existing and newly-constructed buildings in the area are included in the target of the assessment.
- Since the characteristics of central business districts (CBD), commercial areas, residential areas, and rural areas differ in land-use planning, they are divided into the following two groups and then assessed.
  1) Central Business Districts (CBD) and Commercial Areas: The ratio of residential use to the total floor area of all buildings is assessed.
  2) Residential Areas and Rural Areas: The ratio of non-residential use to the total floor area of all buildings is assessed.
- Residential use includes residential buildings, such as single-family houses, apartments, company housing and dormitories.
- Non-residential use refers to any uses other than the above-mentioned ‘residential use’.

*Referred to Leadership in Energy & Environmental Design-Neighbourhood

Development (LEED-ND) for the ratios (LEED ND – SMART LOCATION AND LINKAGE – Housing and Jobs Proximity).

1.2. Land Use

Efficient land use and mixed use of the land concentrate the urban functions.

1.2.1. Efficient Land Use

Assess the ratio of areas used to the standard floor area ratio specified by the land-use planning. An assessment shall be also carried out for multiple-use planning.

★	30% or less is used
★★	30% to 50% is used
★★★	50% to 90% is used
★★★★	90% or more is used
★★★★★	Floor area ratio exceeds the standard floor area ratio by applying a system/method. 90% or more of the standard floor area ratio is used, and a system/method for multiple-use planning in a specific area is prepared.

■ Remarks

- Efficient land use and multiple ways of land use contribute to level energy demand.
- All buildings in the target area, whether newly-constructed or existing, are assessed.
- The following three-point assessment is applied to the rural areas since achieving the standard floor area ratio and using land in multiple ways is difficult in rural areas .

  ★ : 30% or more is used

  ★★★ : 50% or more is used

  ★★★★★ : 90% or more is used

*A system/method refers to a comprehensive design system, district planning specifying special districts, high level use districts, districts promoted for redevelopment and special urban renaissance districts.

*Specific areas refer to major public transportation hubs (stations, terminals, etc.), central urban areas, etc.

*Multiple-use planning refers to a building that is used not for a single purpose but for multiple purposes.

*Refer to CASEBEE for the ratios (CASBEE for Urban Development – 3.1.2.2

Land Use).

1.3. TOD (Transit Oriented Development)

Transit oriented development promotes the shift to an urban structure that is not dependent on private cars.

1.3.1. City Development Centred on Public Transportation

Assess the presence or absence of upper-level plans which promote transit oriented city development.

★	There are no upper-level plans. However, a system for their formulation has been established
★★	There are no upper-level plans. However, a system for their formulation has been organised, and prospects for their formulation are clear
★★★	There are upper-level plans.
★★★★	Projects are in place based on the upper-level plans
★★★★★	Projects are in place based on the upper-level plans, and a system/method to disseminate the plans has been established

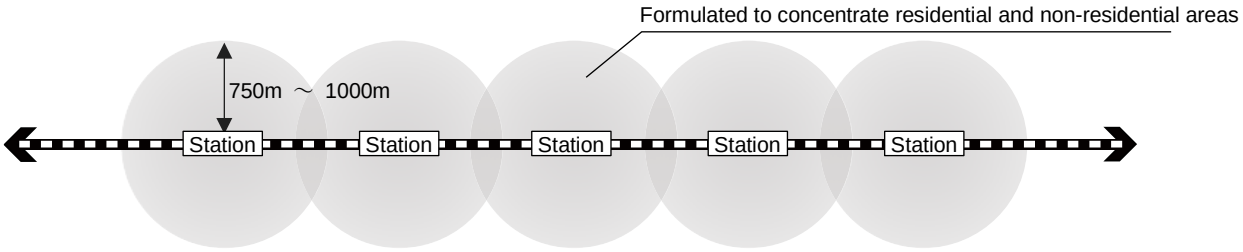
■ Remarks

- Upper-level plans refer to basic concepts, basic plans, urban master plans, redevelopment policy, regional transportation plans, etc. developed in the low-carbon town project planning of the local government.
- Example of upper-level plans: Plans are formulated to concentrate residential and non-residential areas within walking distance (radius of 750m and 1000m) from public transits, such as train stations and bus terminals.
- Example of upper-level plans: Plans are formulated for areas solely for residential and rural areas, in order to concentrate residential areas (partly include non-residential areas) within walking distance (radius of 750m to 1000m) from bus stops, LRT stations, etc.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans will be completed within a certain period of time (approximately one to three years).

*A system/method refers to a comprehensive design system, district planning specifying special districts, high level use districts, districts promoted for redevelopment and special urban renaissance districts.

Figure 4. Image of Residential and Non-residential Areas within Walking Distance from Stations



2. Buildings

2.1. Energy Saving Construction

Energy saving construction contributes to the creation of a low-carbon town by reducing the amount of energy consumed by a building.

2.1.1. Thermal Performance

Assess the presence or absence of systems or standard to evaluate the thermal performance of buildings.

★	There are no systems or standard in place. However, a system for their formulation has been established.
★★	There are no systems or standard in place. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	There are systems and standard in place.
★★★★	There are systems and standards in place, which have been implemented.
★★★★★	There are systems and standards in place, which have been implemented. In addition, there are subsidies and incentive schemes to accelerate implementation, or there are legally binding regulations.

■ Remarks

- Energy used for heating and cooling can be saved by reducing the amount of heat transfer through the building façade (walls and windows) to the inside of the building, or from inside to the outside of the building.
- Therefore, reducing the thermal load of the building facade is important when designing and constructing the building.

・ As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

2.1.2. Energy-Saving Equipment Performance

Assess the presence or absence of systems or standard to evaluate the energy-saving performance of building equipment.

★	There are no systems or standard in place. However, a system for their formulation has been established.
★★	There are no systems or standard in place. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	There are systems and standard in place.
★★★★	There are systems and standard in place, which have been implemented.
★★★★★	There are systems and standard in place, which have been implemented. In addition, there are subsidies and incentive schemes to accelerate implementation, or there are legally binding regulations.

■ Remarks

・ Building equipment refers to building facilities, such as air conditioning, lighting, water supply and drainage, that consist of machinery, piping, wiring and other instruments.

・ The total energy consumption of a building can be reduced by the introduction or replacement of existing equipment with less energy-consuming (electricity and gas) equipment.

・ As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain

period of time (approximately one to three years).

2.1.3. Natural Energy

Assess the presence or absence of systems or standard to supply energy from natural source to supplement a part of the energy demand.

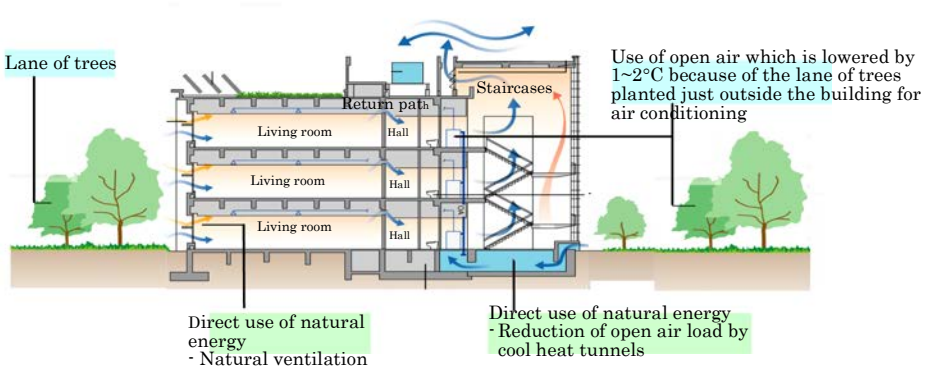
★	There are no systems or standard in place. However, a system for their formulation has been established.
★★	There are no systems or standard in place. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	There are systems and standard in place.
★★★★	There are systems and standard in place, which have been implemented.
★★★★★	There are systems and standard in place, which have been implemented. In addition, there are subsidies and incentive schemes to accelerate implementation, or there are legally binding regulations.

■ Remarks

- Use of natural energy refers to the direct use of daylight, natural ventilation, etc. for air conditioning and lighting without using equipment, such as an air-conditioners and lighting devices.
- Passive design is one of the architectural design methods. Lighting, heating and air flow are controlled solely by natural energy using well-designed structures and materials to create a comfortable indoor environment.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

Figure 5. Image of Using Natural Energy



2.2. Green Construction

Expansion of buildings with high energy performance contributes to a low-carbon town.

2.2.1. Green Construction Guidelines

Assess the presence or absence of the formulation of green construction guidelines

★	There are no guidelines in place. However, systems for their formulation have been established.
★★	There are no guidelines in place. However, systems for their formulation have been established, and prospects for their formulation are clear.
★★★	There are guidelines in place.
★★★★	There are guidelines which have been implemented.
★★★★★	There are guidelines which have been implemented. In addition, subsidies and incentive schemes to disseminate the guidelines that have been established.

■ Remarks

- Green construction guidelines are used to assess a building by its environmental performance, using indicators to comprehensively evaluate the quality of the building with regards to the overall energy consumption, indoor comfort, development without environmental degradation, etc.
- Green construction guidelines refer to all assessment systems or guidelines formulated by an individual economy, such as Green Star developed in Australia, Green Building Initiatives (GBIs) developed in People's Republic of China, CASBEE developed in Japan, BCA Green Mark Scheme developed in Singapore, Building Research Establishment Environmental Assessment Method (BREEAM) developed in the UK, and LEED developed in the United States.
- In addition, the above guidelines also include other assessment systems or guidelines prepared by local governments or by public agencies for the

development of specific areas.

- As for evaluation rank 1 (★), even if the system has not been established, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

Figure 6　Examples of Environmental Performance Rating System

3. Transportation

3.1. Promotion of Public Transportation

Dependence on private cars can be decreased by promoting the use of public transportation, such as railways and buses, as well as introducing mass-transportation systems.

3.1.1. Easy-to-Use Public Transportation

Assess the coverage ratio of the areas of walking distance from the train stations and bus stops to the target area.

★	The coverage is 30% or less of the target area
★★	The coverage is 30% to 50% of the target area
★★★	The coverage is 50% to 70% of the target area
★★★★	The coverage is 70% to 90% of the target area
★★★★★	The coverage is 90% or more of the target area

■ Remarks

- Public transportation includes electric trains, buses, taxis and car-sharing.

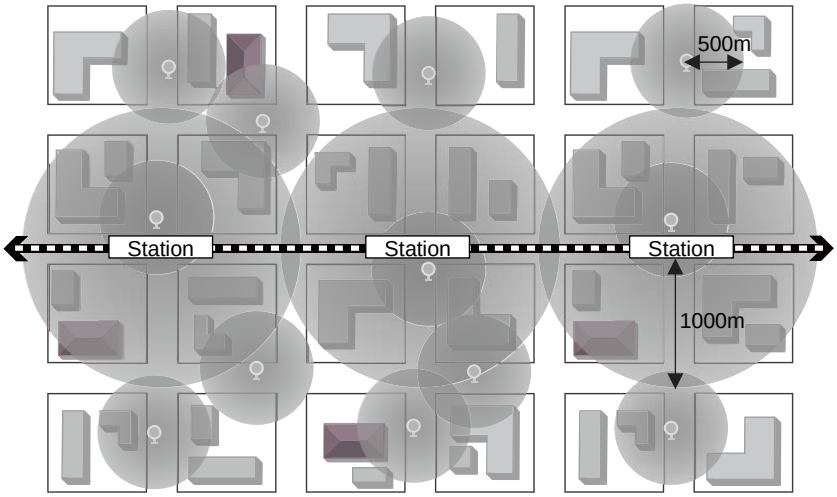
*Taxis include bike taxis.
*Car-sharing includes use by an unspecified number of people.

- Public transportation includes trains (includes light electric trains, such as LRT) and buses.

・ Coverage ratio refers to the proportion of range (area of a circle) with a radius of 500m-1000m, centring on train stations and bus stops, to the entire range (assessment target area).

*Train station: radius of 1000m
*Bus stop: radius of 500m
*The range of walking distances (500m or1000m) were referenced from CASBEE (CASBEE for Urban Development – 3.1.1.1 Development of traffic facilities), while LEED ND adopts 400m or 800m

Figure 7 Image of Walking Distance from Stations and Bus Stops



3.1.2. Comprehensive Transportation Measures

Assess efforts in transportation measures that aim for a low-carbon society.

★	Measures for transportation have not been made yet. However, a system for their formulation has been established.
★★	Measures for transportation have not been made yet. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	One or more measures for transportation are in place.
★★★★	Three or more measures for transportation are in place.
★★★★★	Five or more measures for transportation are in place.

■ Remarks

・ Comprehensive transportation measures refer to measures to achieve a sustainable traffic system where public transportation, which plays a central role, cars, bicycles and walking are integrated in a balanced manner (excerpt from CASBEE).

- The following are examples of measures for transportation.
  1) Car-sharing
  2) Rental bicycle system
  3) Provision of bicycle lanes
  4) Provision of bicycle-parking areas around public transportation stations (electric train or bus)
  5) Implementation of park and ride (P&R)
  6) Introduction of massive transportation system such as BRT and LRT
- Promotion of measures such as the introduction of subsidies to promote BRT or LRT.
- Formulation of a master plan for transportation measures, etc.
- Transportation measures in addition to those mentioned above are also targeted for assessment.
- Low-carbon vehicles include EV buses, natural gas buses, fuel-cell buses, etc. Definitions of these vehicles are pursuant to those specified by each economy.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

3.2. Improvement in Traffic Flow

Improve traffic flow and traffic congestion by traffic management

3.2.1. Transportation Demand Management (TDM）

Assess efforts to collectively control traffic signals in order to reduce traffic congestion

★	Efforts have not been made yet. However, a system for their formulation has been established.
★★	Efforts have not been made yet. However, a system for their formulation has been made, and prospects for their formulation are clear.
★★★	One or more traffic demand management measures are in place.
★★★★	Three or more traffic demand management measures are in place.
★★★★★	Five or more traffic demand management measures are in place.

■ Remarks

- TDM refers to efforts to reduce traffic congestion by making ‘adjustments in traffic demand’, such as control of traffic volume and alleviating concentrated traffic by promoting efficient use of cars and shifting to public transportation (excerpted from the Bureau of Environment, Tokyo Metropolitan Government).
- Assess the presence or absence of efforts to collectively control traffic signals, including road signals, signals for pedestrian crossing and systems for handling traffic accidents.
- Assess the presence or absence of traffic demand management measures by the local governments in the target area.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

- In addition to the above mentioned approaches, efforts to reduce traffic congestion taken by each economy are also targeted.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

*Referred to the measures regarding traffic demand management in climate change measures taken by the Bureau of Environment, Tokyo Metropolitan Government.

3.2.2. Transportation Infrastructure Planning

Assess road development and improvement to control congestion and achieve smooth traffic flow.

★	There are no plans for the road improvement. However, a system for the road improvement has been established.
★★	There are no plans for the road improvement. However, a system for the road improvement has been established, and prospects for their establishment are clear.
★★★	There are plans for the road improvement.
★★★★	There are plans for the road improvement, and they have been partially achieved.
★★★★★	There are plans for the road improvement, and they have been mostly achieved.

■ Remarks

- Assess plans for a transportation infrastructure, including road development and improvement, in order to achieve smooth traffic flow.
- Plans for traffic infrastructure to be assessed refers to developments to solve congestion and promote smooth traffic flow, and also refers to plans such as multi-level crossings and roundabouts.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

3.3. Introduction of Low-Carbon Vehicles

The dissemination of low-carbon vehicles contributes to the low-carbon town development, as they hardly emit exhaust gases, such as carbon dioxide and air polluting substances. In addition, regulations of air pollution contaminants, such as SPMs and exhaust gas, assessed in 12.1 Air Pollution.

3.3.1. Introduction of Low-Carbon Vehicles

Assess subsidy schemes, etc. to introduce low-carbon vehicles.

★	There are no subsidy schemes, etc. However, a system for their formulation has been established.
★★	There are no subsidy schemes, etc. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	There are subsidy schemes.
★★★★	There are subsidy schemes, etc. and measures to make use of these schemes including PR activities are in place or the schemes are already being utilised.
★★★★★	There are subsidy schemes, etc. and measures to make use of these schemes including PR activities are in place, or the schemes are already being utilised. In addition, there are subsidy schemes to develop an infrastructure (EV charging facilities, hydrogen stations, etc.) for low-carbon vehicles.

■ Remarks

- Assess the presence or absence of subsidy schemes formulated by the local governments of the assessment target areas.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

- Low-carbon vehicles refers to EV, HEV, PHV, FCV, natural gas vehicles, etc. Targets for assessment include vehicles designated by each economy as low-carbon vehicles. For example, in some economies diesel engine vehicles, etc. are regarded as low-carbon vehicles.
- Targets for assessment also include subsidy schemes for the development of related infrastructures, such as EV charging facilities and hydrogen stations.

* ★★★★★ is awarded if both the promotion of the purchase of low-carbon vehicles and the related infrastructure development are implemented.

・ As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

3.4. Promotion of Efficient Use

Reduction of fuel consumption by promoting eco-driving contributes to the low-carbon town development.

3.4.1. Support for Eco-driving

Assess plans for the introduction of eco-driving support devices and their implementation status.

★	There are no plans. However, a system for the promotion of eco-driving has been established.
★★	There are no plans. However, as system for the promotion of eco-driving has been established and prospects for the promotion are clear.
★★★	There are plans.
★★★★	There are plans, which are actually in operation.
★★★★★	There are plans, which are actually in operation. In addition, subsidy and incentive schemes to promote the introduction of eco-driving support devices have been prepared.

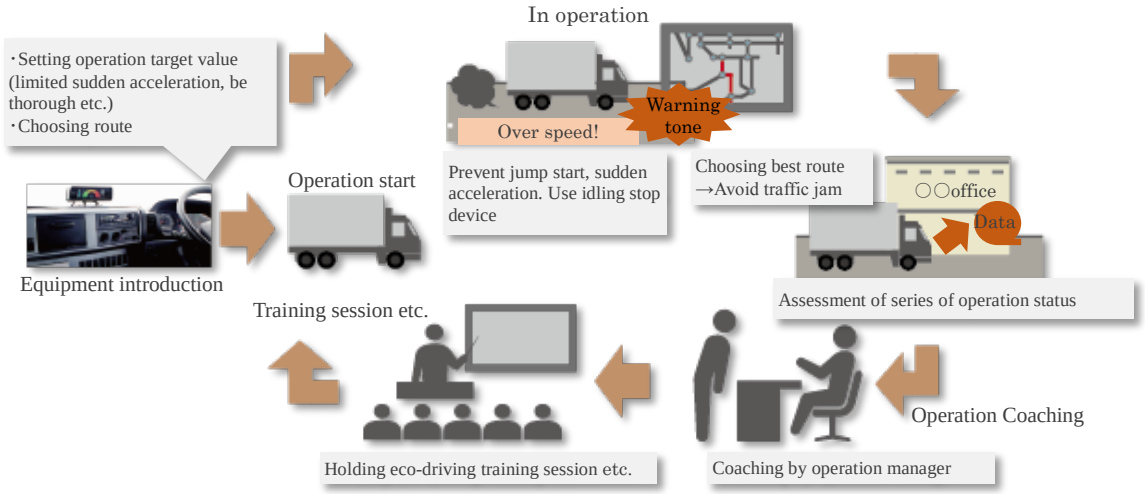
■ Remarks

・ As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

*Eco-driving support devices refers to devices, such as eco-driving meters (on-board devices, fuel consumption meters, etc.), which are installed in vehicles to control CO_2 emissions by promoting eco-driving.

Figure 8　Image of Eco Driving Control System



Source: Ministry of Land, Infrastructure, Transport and Tourism

3-2. Supply

4. Area Energy System

4.1. Area Energy

Area energy utilising thermal energy (cold water, steam, hot water) among multiple facilities contributes to the low-carbon town development.

4.1.1. Introduction of Area Energy

Assess the annual air-conditioning consumption in the target area covered by the area energy system and the presence or absence of plans for introduction.

★	There are no plans for introduction in place. However, a system for the introduction has been established.
★★	There are no plans for introduction in place. However, a system for the introduction has been established and prospects for its introduction are clear.
★★★	There are plans for introduction in place.
★★★★	50% or more of the annual air-conditioning costs are covered by area energy.
★★★★★	70% or more of the annual air-conditioning costs are covered by area energy.

■ Remarks

- Area energy refers to district heating and cooling (DHC), district heating systems (DH) and district cooling systems (DC).
- Coverage ratio of area energy should be calculated adding hot-water supply to air-conditioning.
- The introduction plans should be evaluated by municipalities or development agencies.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

*Development agencies refer to administrative entities or private developers planning to carry out development in a specific area.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Even though Area Energy Management System is technically possible in any type of town, its business feasibility depends on the town structure and density.
*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).
*Referred LEED for coverage ratios. (LEED ND – GREEN INFRASTRUCTURE AND BUILDINGS – Districts Heating and Cooling)

5. Untapped Energy

5.1. Untapped Energy

Utilisation of untapped energy contributes to the low-carbon town development.

5.1.1. Introduction of Untapped Energy

Assess the annual consumption of electricity and thermal energy in the target area covered by untapped energy and the presence or absence of introduction plans.

★	There are no plans for introduction in place. However, a system for the introduction has been established.
★★	There are no plans for introduction in place. However, a system for the introduction has been established and prospects for its introduction are clear.
★★★	There are plans for introduction in place.
★★★★	2.5% of annual electricity/thermal energy costs are covered by untapped energy
★★★★★	5% of annual electricity/thermal energy costs are covered by untapped energy.

■ Remarks

- Untapped energy refers to potential energy sources, such as thermal energy, wastewater and exhaust heat from underground facilities (subways, underground malls, etc.).
- The introduction plans should be evaluated by municipalities or development agencies.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies refer to administrative entities or private developers

planning to carry out development in a specific area.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

6. Renewable Energy

6.1. Renewable Energy

Utilisation of renewable energy contributes to lower-carbon emissions.

6.1.1. Introduction of Renewable Ener

Assess the annual consumption of electricity and thermal energy in the target area covered by renewable energy and the presence or absence of its introduction plans.

★	There are no plans for introduction in place. However, a system for the introduction of renewable energy has been established.
★★	There are no plans for introduction in place. However, a system for the introduction of renewable energy has been established and prospects for its introduction are clear.
★★★	There are plans for introduction in place.
★★★★	7.5% of annual electricity/thermal energy costs are covered by renewable energy.
★★★★★	15% of annual electricity/thermal energy costs are covered by renewable energy.

■ Remarks

- Renewable energy refers to sunlight/solar heat, wind power, water power, geothermal power, biomass, etc.
- The introduction plans should be evaluated by municipalities or development agencies.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

*Development agencies refer to administrative entities or private developers

planning to carry out development in a specific area.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).
*The above-mentioned coverage ratios were determined based on the introduction goals of renewable energy for the EU and Japan (EU: 20%, 2020; Japan: 20%, 2030). The coverage ratios were equally allocated for 'untapped energy' and 'renewable energy'.

7. Multi-Energy System

7.1. Multi-Energy

Efficient energy use can be achieved by collecting (making use of) electricity and thermal energy (exhaust heat) simultaneously.

7.1.1. Introduction of a Multi-Energy System

Assess the presence or absence of introduction plans for Combined Heat and Power (CHP) or cogeneration in an electric power supply system.

★	There are no plans for introduction in place. However, a system for the introduction of CHP has been established.
★★	There are no plans for introduction in place. However, a system for the introduction of CHP has been established and prospects for its introduction are clear.
★★★	There are plans for introduction in place.
★★★★	There are introduction plans which have been implemented.
★★★★★	There are introduction plans which have been implemented. In addition, subsidy schemes, etc. for expansion of implementation have been established.

■ Remarks

- Multi-energy refers to CHP or Cogeneration.
- CHP or cogeneration are systems that use natural gas, petroleum, propane gas, etc. to simultaneously generate electricity and utilise waste heat by means of an engine, turbine, fuel cell, etc. The recovered waste heat, converted into steam or hot water, can be used for air-conditioning or heating. By effectively using heat and electricity without waste, an overall system

energy efficiency of 75-80% (based on the potential energy of the fuel source) can be achieved. (source: ANRE Japan homepage)

- By introducing CHP or cogeneration, the amount of electricity from the power grid can be reduced, while the waste heat can be used for hot-water supply and air-conditioning, reducing the overall consumption of primary energy.
- In rural areas, '4.1. Area Energy' should be used for assessment.
- The introduction plans should be evaluated by municipalities or development agencies.

  *Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
  *Development agencies refer to administrative entities or private developers planning to carry out development in a specific area.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

  *Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

3-3. Demand & Supply

8. Energy Management System

8.1. Energy Management of Buildings/Area

Effective management of energy use in the individual building or multiple buildings in an area will lead to energy conservation in a sustainable manner while contributing to the creation of a low-carbon town.

8.1.1. Energy Management System (EMS)

Assess the presence or absence of EMS introduction plans.

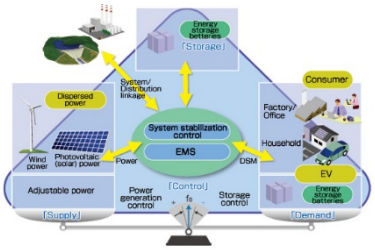
★	There are no plans for introduction in place. However, a system for the introduction of EMS has been established.
★★	There are no plans for introduction in place. However, a system for the introduction of EMS has been established and prospects for their introduction are clear.
★★★	There are plans for introduction in place.
★★★★	There are introduction plans which have been implemented.
★★★★★	There are introduction plans which have been implemented. In addition, subsidy schemes, etc. for expansion of implementation have been established.

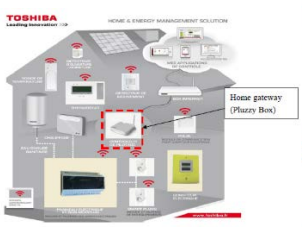
■ Remarks

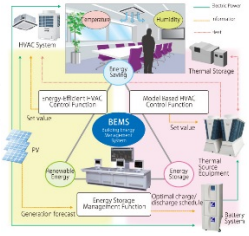
- EMS refers to systems or technologies that enable energy conservation through visualising energy consumption, controlling and monitoring of building and equipment operations, as well as optimising the use of renewable energy.
- EMS could be divided into EMS for homes (HEMS), buildings (BEMS) and factories (FEMS) depending on the building use.
- Any of the introduction plans of HEMS, BEMS and FEMS can be evaluated.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

Figure 9 Image of EMS, HEMS and BEMS







Source：Hitachi, Ltd.　　Source：TOSHIBA CORPORATION

8.1.2. Area Energy Management System (AEMS)

Assess the presence or absence of AEMS introduction plans.

★	There are no plans for introduction in place. However, a system for the introduction of AEMS has been established.
★★	There are no plans for introduction in place. However, a system for the introduction of AEMS has been established and prospects for their introduction are clear.
★★★	There are plans for introduction in place.
★★★★	There are introduction plans which have been implemented.
★★★★★	There are introduction plans which have been implemented. In addition, subsidy schemes, etc. for expansion of implementation has been established.

■ Remarks

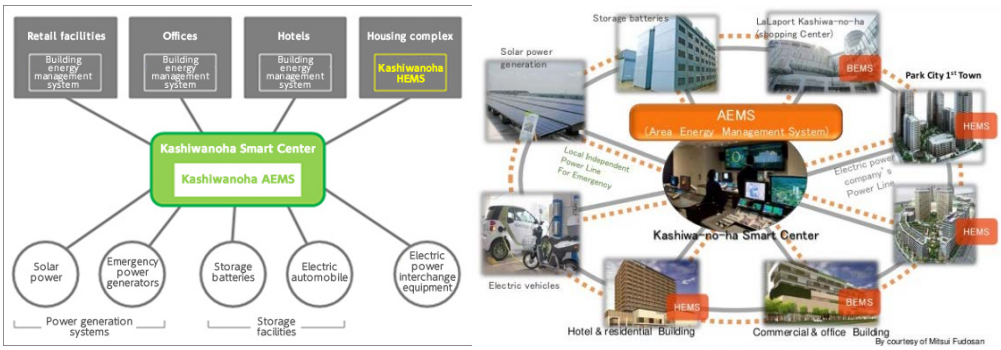
- AEMS refers to the control and management of area-wide energy supply/demand which takes into account energy conservation and CO_2 emissions of the target area. AEMS enables efficient operations of electricity generation and storage by monitoring and analysing the energy use status in multiple buildings in the area, climate information, etc.
- The introduction plans should be evaluated by municipalities or development agencies.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies include administrative entities and private developers.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

Figure 10 Image of AEMS



Source : KASHIWA-NO-HA SMART CITY

8.1.3. Smart Micro-Grid

Assess the presence or absence of smart micro-grid introductions plans in the target area.

★	There are no plans for introduction in place. However, a system for the introduction of smart micro grid has been established.
★★	There are no plans for introduction in place. However, a system for the introduction of smart micro grid has been established and prospects for their introduction are clear.
★★★	There are plans for introduction in place.
★★★★	There are introduction plans which have been implemented.
★★★★★	There are introduction plans which have been implemented. In addition, subsidy schemes, etc. for expansion of implementation have been established.

■ Remarks

- Smart grid is typically used to describe the desired features of an electric power supply system and its concept varies depending on the economy or area. Generally speaking, it ‘seeks to achieve a highly efficient, high quality, highly trusted electricity supply system that integrates and applies the information from multiple distributed electricity sources and users by utilising information communication technology in addition to the conventional integrated operations of a centralised power supply and transmission system’. (source: NEDO Renewable Energy Technology White Paper)
- Micro-grid refers to the integration of multiple small distributed electricity sources, electricity storage equipment and electricity users to form a network. Although this integrated network (micro-grid) can be operated independently from the central grid, it could be operated in connection with the central grid

or other micro-grids. A micro-grid should be designed, established and controlled based on the needs of the users. (source: Guidebook for Region-focused Introduction of New Energy, New Energy and Industrial Technology Development Organization)

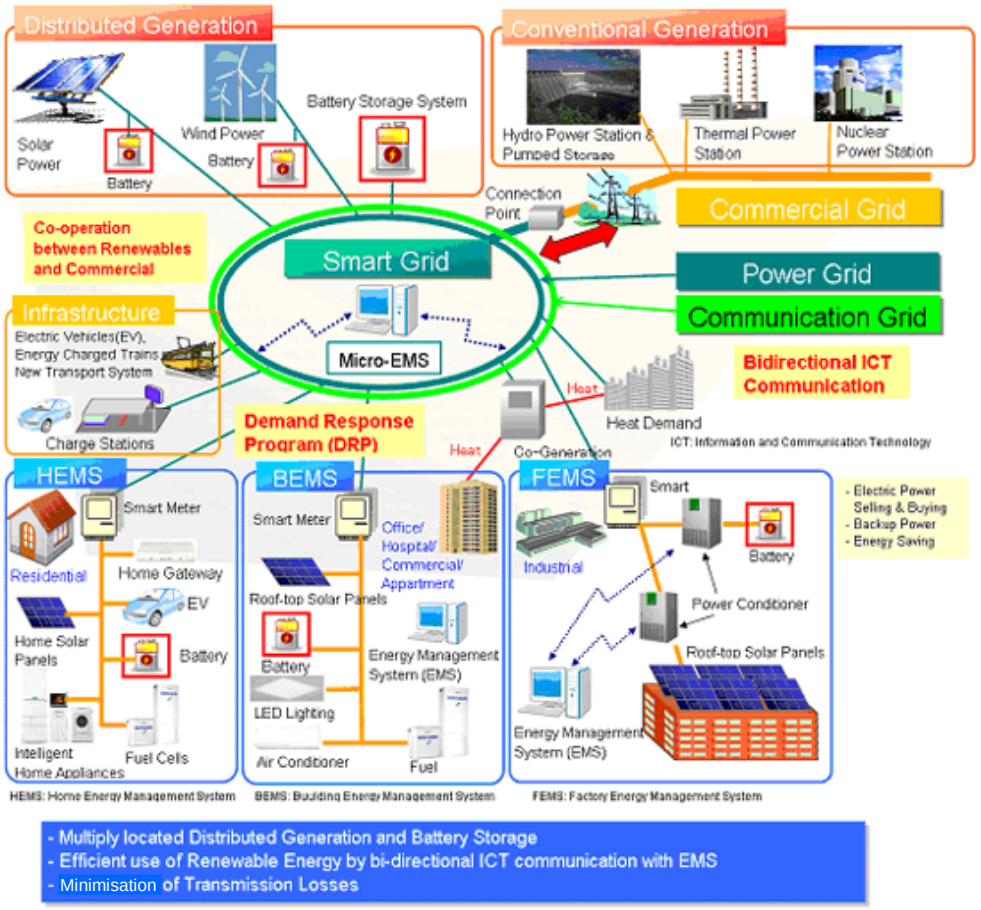
- Plans by municipalities or development agencies should be assessed. Introduction plans of underlying technologies that may affect energy demand, price fluctuations, etc. within the targeted area should be included in the assessment.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level. *Development agencies include administrative entities and private developers.
*Underlying technologies include smart meters, power conditioners, transmission facilities and fuel cells. For untapped energy/renewable energy, refer to 5.1 and 6.1 for assessment, and for EMS, refer to 8.1.1 and 8.1.2. When assessing underlying technology, ‘smart meters’ and ‘relevant control equipment’ are targeted.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

Figure 11 Image of Smart Grid



Source：Toshiba Corporation

3-4. Environment & Resources

9. Greenery

9.1. Securing Green Space

Although greenery contributes to alleviate city climate, reducing air-conditioning energy and the amount of CO_2 emissions. The effect of lower carbon emissions by greenery is as follows.

- Creation of cool spots by green shade.
- Reduced heat island phenomenon by improving ground cover.
- Creation of wind paths, etc. by green network and the appropriate placement of greenery and buildings, etc.

In addition, greenery serves as a CO_2 sink and is an important factor from the standpoint of biomass energy application.

9.1.1. Formation of Green Shade

Assess the ratio of green shade to the targeted area

★	10% or less
★★	10%～25%
★★★	25%～40%
★★★★	40%～60%
★★★★★	60% or more

■ Remarks

- Green shade refers to shade (shadows) created by trees.
- The ratio of green shade refers to the percentage of total green shade area to the total targeted area.
- See below about green space standard and green shade area calculation

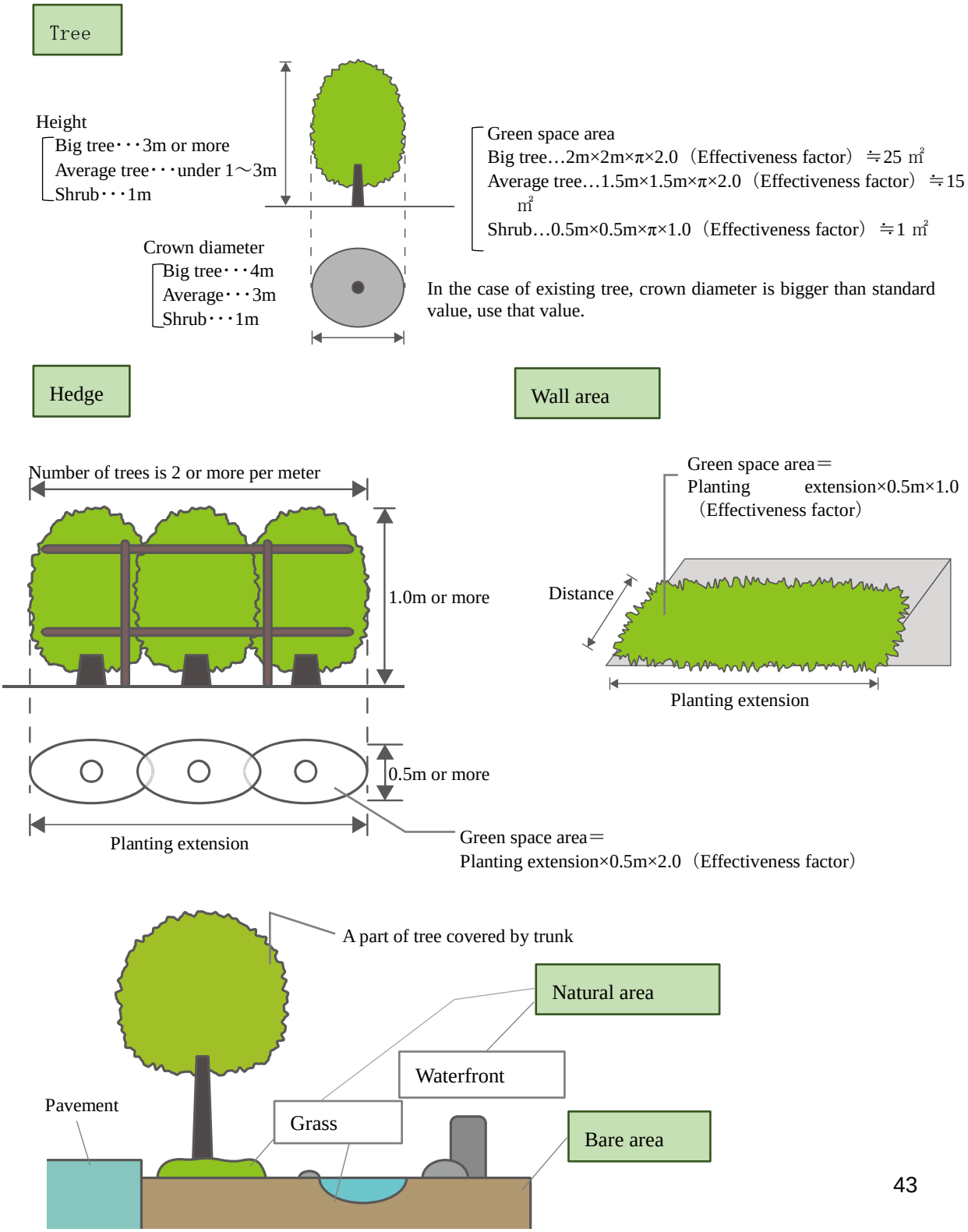
Green space		Standard	Standard area	Effectiveness factor	Green space area
Tree	Big tree	Tree height is 3m or more （In the future, tree height will be 4m or more）	Area of a circle as 4m of crown diameter	2.0	25 ㎡
	Middle tree	Tree height is 1m or more and under 3m	Area of a circle as 3m of crown diameter	2.0	15 ㎡
	Shrub	Tree height is under 1m	Area of a circle as 1m of crown diameter	1.0	1 ㎡
Hedge		Hedge height is 1m or more and number of trees are 2 or more per meter	As 0.5m in width, Planting extension × Width （㎡）	2.0	Standard area × Effectiveness factor
Wall area			Planting extension×Width （㎡）	1.0	
Natural area		Grassland, Riparian area		1.0	
Bare area				0.8	
Parking space		Greening parking space		1.0	
		Greening possible parking		0.8	

	area			
Rooftop			0.5	
Planter			0.5	

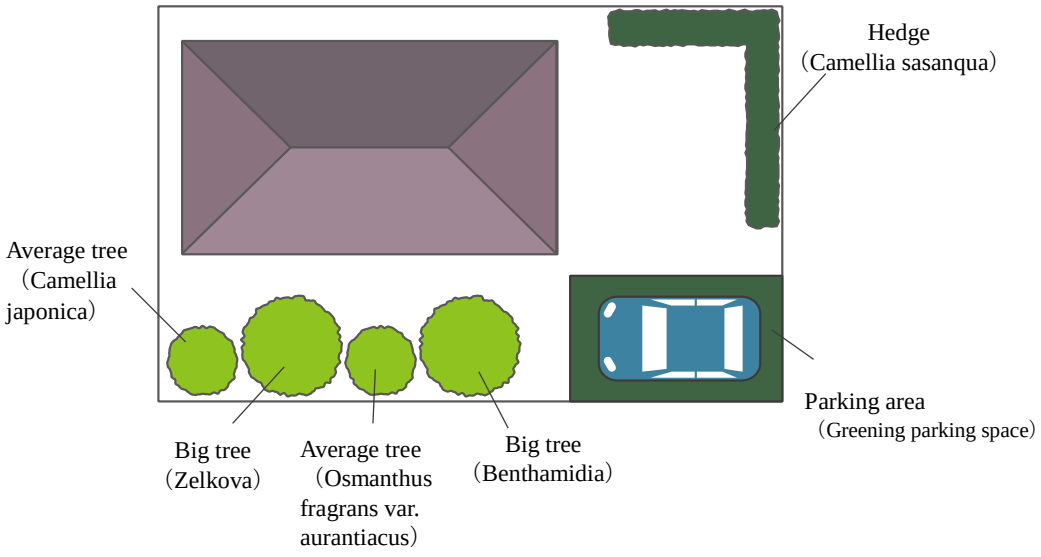
*In LEED-ND, tree spacing (within 12m) is used as the assessment criteria.

(LEED ND – NEIGHBORHOOD PATTERN AND DESIGN – Tree-Lined and Shaded Streets)

Figure 12　Illustration of Green Shade Ratio Calculation Method



Ex) In the case of ground floor 200 ㎡, building area 80 ㎡



Green-space area

Big tree（ex. Zelkova・Benthamidia）2 trees×25＝50.0 ㎡

Average tree（ex. Osmanthus fragrans var. aurantiacus・Camellia japonica）

2 trees×15＝30.0 ㎡

Hedge（ex. Camellia sasanqua）

Extension（10m）×breadth（0.5m）×Effectiveness factor（2.0）＝10.0 ㎡

Parking area per car（2.5m×5m）×Effectiveness facto（1.0）＝12.5 ㎡

Green shade ratio

$$\text{Green coverage ratio} = \frac{\text{Green space area}}{\text{Ground floor area}} \times 100\%$$

$$= \frac{(50+30+10+12.5)}{200} \times 100\%$$

$$= \frac{102.5\ \text{㎡}}{200} \times 100\%$$

$$= 51.25\%$$

Source: Kanazawa city (Japan) HP

9.1.2. Formation of Greening

Assess efforts to implement greening and efforts in ecosystem conservation of the entire targeted area.

★	The ratio of greenery is 20% or less.
★★	The ratio of greenery is 20% or less. However, efforts in ecosystem conservation have been made.
★★★	The ratio of greenery is 20%～40%
★★★★	The ratio of greenery is 20%～40%. However, efforts in ecosystem conservation have been made.
★★★★★	The ratio of greenery is 40% or above and efforts in ecosystem conservation have also been made.

■ Remarks

- The ratio of greenery refers to the percentage of area of greenery to the total targeted area.
- That is, (Area of greenery + Area of water surface)/Total Area. (Excerpt from CASBEE).
- Targeted greenery is as follows.
  - Lawn
  - Flowerbeds
  - Trees
  - Rooftop greening/Wall area greening
  - Water streams, ponds etc.
- Efforts toward ecosystem conservation refers to the maintenance of habitat for various creatures such as biotopes, sanctuaries, etc. The identification and maintenance of important wild creatures and their habitat, such as swamps and water areas, have been made, or there are plans to do so.

*Reference CASBEE for the ratios (CASBEE for Urban Development – 1.2.1 Greenery).

【Example of greening ratio calculation method】

1． Area calculation method of each greening institution division.
Area calculation method of each greening institution division is as follows.

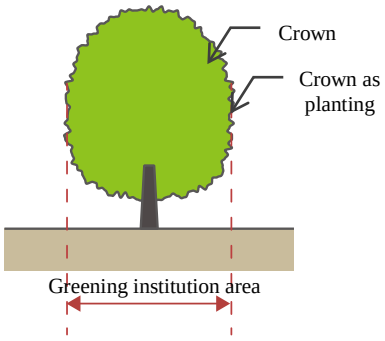
1） Tree

In regards to tree, calculate following any methods which are next 3 ways. Choose the best method to calculate as follows.

①Total horizontal projection area of crown.
②Total horizontal projection area of ‘considered crown’ which appropriative tree height.
③Total horizontal projection area of planting base fulfils certain conditions.

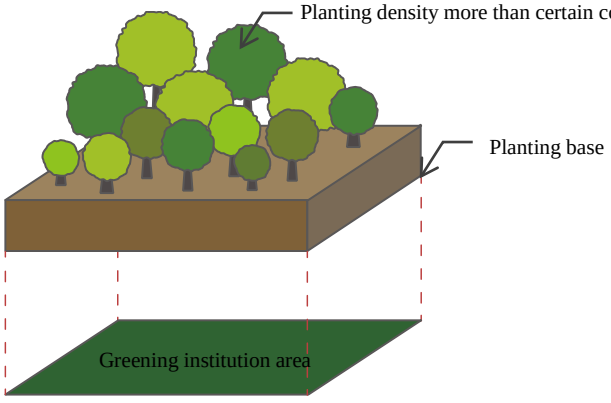
① Total horizontal projection area of crown.
Provided that, in the case of overlap crown, the crown cannot be approximated for duplication. Furthermore, the crown projection area, unlike in the case of greening institution maintenance plan where the area that was planned and scheduled to be with tree growth is used, the actual horizontal projection area of planting is used.

② Total horizontal projection area of ‘considered crown’ which is approximate tree height. The tree has crown radius as shown in the graph to be appropriate. Tree greening institution area is the total area of horizontal project ‘considered crown’. Provided that, in the case of overlap ‘considered crown’, the crown cannot be approximated for duplication.



Tree height as planting	Considered crown radius
1m more than under 2.5m	1.1m
2.5m more than under 4m	1.6m
More than 4m	2.1m
Note：This calculation method is limited, which tree height 1m or more.	

③ Total horizontal projection area of planting base fulfils certain conditions.
In case of planting more densely than shown below, and the shape or other conditions are appropriate, the horizontal projection area of planting base (soil and other materials) for growing tree can be approximated as the greening institution area.

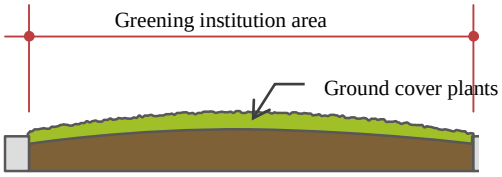


【To be met planting density】
A □ 18T1 ＋ 10T2 ＋ 4T3 ＋ T4
A：Concerned part of horizontal projection area（m2）
T1：Number of trees which height 4m or more
T2：Number of trees which height 2.5m or more under 4m
T3：Number of trees which height 1m or more under 2.5m
T4：Number of trees which under 1m
（Height of the tree when it was planted）

2）Zoysia, other ground cover plants

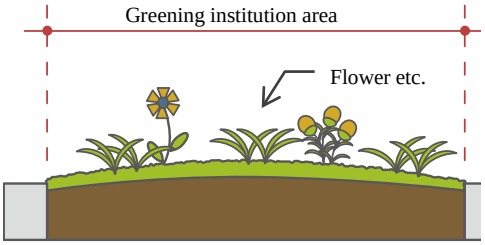
Greening institution area of Zoysia or other ground cover plants is the horizontal projection area covered. Provided that, in the case of overlap, they cannot be approximated for duplication.

Furthermore, unlike in the case of greening institution maintenance plan, rather than the area that was planned and scheduled to be with tree growth, the actual area of planting is used.



3）Flower beds and other similar things

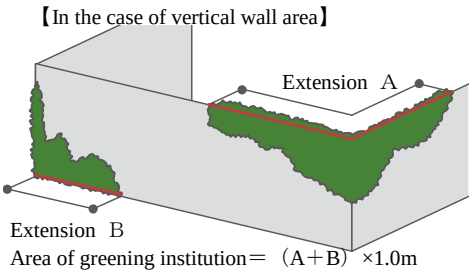
Greening institution area is the horizontal projection area covered by soil or other materials for growing flowers or other similar things. Provided that, in the case of overlap other institutions, they cannot be approximated for duplication.

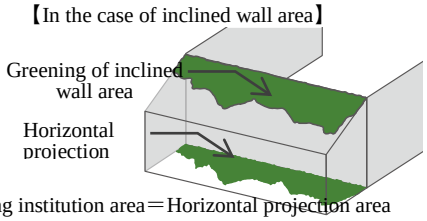


4）In regards to wall area greening

In regards to wall area greening, ‘Total of horizontal projection length of greening institutions has maintained outer wall upstanding part（m）’× 1.0m is the greening institution area. Provided that, when horizontal projection is overlap in the case of multiple planting of the same wall area, they cannot be approximated for duplication.

In regards to greening of vertical wall, the area is the horizontal projection area.



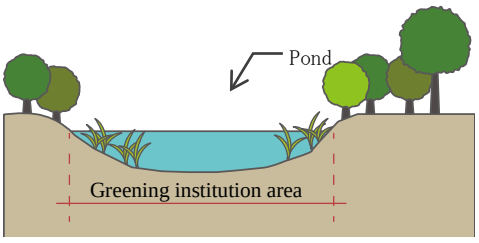


２． Area calculation method of greening institution without planting

Area calculation method of each greening institution division is as follows.

1）Stream, pond and other similar things

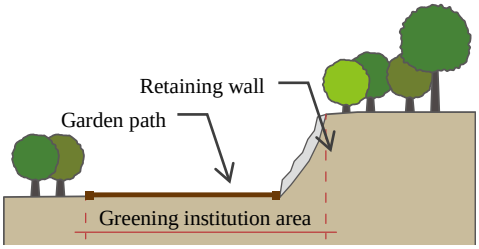
In this case, streams, ponds and the formed natural environment come together with trees or plantings, and the horizontal projection area is the greening institution area. Provided that, in the case of overlap with other institutions, they cannot be approximated for duplication.



2）Garden path, retaining wall, and other institutions as greening institution

Horizontal projection area of that institution is the greening institution area. This range of area does not exceed one quarter of the area totalled ‘Tree’, ‘Zoysia or other ground cover plants’, ‘flower bed and other similar things’, or ‘Stream, pond and other similar things’.

In the case of overlap with other institutions, it cannot be approximated for duplication.



Source：Guidance of System Based on Urban Green Space Conservation Law, Parks and Green Spaces Division, City and Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism

10. Water Management

10.1. Water Resources

Assess the reduction of energy etc. achieved by water resource circulation and reprocessing of drainage.

10.1.1. Water Usage

Assess the presence or absence of efforts to reduce water usage in buildings.

★	Efforts are not made. However, a system for their formulation has been established.
★★	Efforts are not made. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	Efforts are being made.
★★★★	Efforts are being made and actual reduction goals and fiscal year accomplishments are shown.
★★★★★	Efforts are being made and actual reduction goals and fiscal year accomplishments are shown. In addition, subsidy schemes, etc. for introduction of equipment are in place.

■ Remarks

- Assess efforts to save or reduce water usage.
- Regarding efforts, plans by municipalities or development agencies are targeted.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

*Development agencies include administrative and private developers.

*Referred to CASBEE (CASBEE for Urban Development – 1.1.1 Water Resource).

10.1.2. Water Reuse

For water reuse, assess both ‘rainwater use’ and ‘use of recycled waste water’.

Assess the presence or absence of rainwater use.

★	Rainwater is not used. However, a system has been established for rainwater use.
★★	Rainwater is not used. However, a system has been established for rainwater use and prospects for its use are clear.
★★★	Rainwater is used.
★★★★	—
★★★★★	Rainwater is used and goals for its actual use ratio, etc. have been established.

■ Remarks

- Assess the presence or absence of rainwater use and goals in each building and developments to a certain degree.
- Regarding goals, plans by municipalities or development agencies are targeted.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

*Development agencies include administrative or private developers.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans will be completed within a certain period of time (approximately one to three years).

*Reference to CASBEE as CASBEE also assesses the ratio of rainwater use (CASBEE for Urban Development – 1.1.1 Water Resource).

2) Assess the presence or absence of recycled wastewater use.

★	Recycled wastewater is not used. However, a system has been formulated for the use of recycled waste water.
★★	Recycled waste water is not used. However, a system has been formulated for the use of recycled wastewater and prospects of its use are clear.
★★★	Recycled waste water is used in some facilities.
★★★★	Recycled waste water is used in over half of facilities.
★★★★★	Recycled waste water is used in over half of facilities and promotive measures, such as a subsidy system, to expand its use are in place.

■ Remarks

・ Assess the presence or absence of the introduction and use of joint recycled wastewater facilities or the use of ‘reclaimed water’ or ‘recycled wastewater’ from a common infrastructure in the target area.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies include administrative or private developers.

・ As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans will be completed within a certain period of time (approximately one to three years).
*Reference to CASBEE (CASBEE for Urban Development – 1.1.1 Water Resource); a three-point scale was adopted in CASBEE.

11. Waste Management

11.1. Waste Products

Assess the reduction of waste products and promotion of recycling.

11.1.1. Reduction of Waste Products

Assess the presence or absence of goals to reduce the production of waste.

★	There are no actual reduction amount/goals. However, a system for the reduction of waste products has been formulated and goals have been set.
★★	There are no actual reduction amount and goals. However, a system for the reduction of waste products has been formulated and goals have been set up, and prospects for their formulation are clear.
★★★	An actual reduction amount and goals have been established.
★★★★	—
★★★★★	An actual reduction amount and goals have been established and various efforts to achieve the goals have been made.

■ Remarks

- Assess the actual amount of reduction and goals over the long term, including the current situation against the total amount of waste products (home/business/commerce/industry) produced in the target area .
- Regarding the amount of reduction and goals, evaluate the plans by municipalities or development agencies.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies refer to administrative or private developers planning to carry out development in a specific area.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain

period of time (approximately one to three years).

11.1.2. Reuse of Waste Products

Assess the criteria for garbage separation.

★	Separation is not performed. However, a system has been established for the development of a separation plan.
★★	Separation is not performed. However, a system has been established for the development of a separation plan and the prospects for development are clear.
★★★	Separation is performed.
★★★★	—
★★★★★	Separation is performed and various efforts to promote and improve separation are being made.

■ Remarks

- Regarding garbage separation, the more detailed it is, the higher the recycling ratio of resources and less energy is necessary for garbage incineration.
- Since the type of garbage separation varies by each economy, assess whether separation is carried out or not.
- For garbage separation, evaluate plans by municipalities or development agencies.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies include administrative or private developers, etc.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

12. Pollution

12.1. Air

Assess efforts to control air pollution and to reduce energy consumption required for air pollution countermeasures.

12.1.1. Air Pollution

Assess the presence or absence of efforts to prevent air pollution.

★	Efforts have not been made. However, a system for their formulation has been established.
★★	Efforts have not been made. However, a system for their formulation has been established and prospects for their formulation are clear.
★★★	Efforts are being made.
★★★★	Efforts are being made and exhaust gas from facilities or vehicles (particularly diesel vehicle) are regularly checked and directions have been provided.
★★★★★	Efforts are being made and exhaust gas from facilities or vehicles (particularly diesel vehicle) are regularly checked and directions have been provided. Furthermore, specific goals, such as the amount of reduction of contaminant and exhaust gas regulation have been established.

■ Remarks

- Facilities and vehicles (particularly diesel vehicle) that exhaust or spread contaminants, such as NOX, SOX and SPMs, are targeted in the area.
- Assess whether the exhaust gas regulation has been established for facilities and vehicles.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

12.2. Water Quality

Assess efforts to control water pollution and to reduce energy consumption required for water pollution countermeasures.

12.2.1. Water Pollution

Assess the presence or absence of efforts to prevent water pollution.

★	Efforts have not been made. However, a system for their formulation has been established.
★★	Efforts have not been made. However, a system for their formulation has been established, and prospects for their formulation are clear.
★★★	Efforts are being made.
★★★★	Efforts are being made and regular checks and direction are provided to areas and facilities where water pollution is expected.
★★★★★	Efforts are being made and regular checks and direction have been provided to the area and facilities where water pollution is expected. Furthermore, actual goals to prevent water pollution have been established.

■ Remarks

- Assess the environmental criteria regarding water pollution for public water areas in the municipality of the targeted area.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately. one to three years).

*Regarding standard values, use the standard value set by each economy for assessment.

12.3. Soil

Assess efforts to control soil contamination and to reduce energy consumption required for soil contamination countermeasures.

12.3.1. Soil Contamination

Assess the presence or absence of efforts to prevent soil contamination.

★	Efforts have not been made. However, a system for their formulation has been established.
★★	Efforts have not been made. However, a system for their formulation has been established and prospects for their establishment are clear.
★★★	Efforts are being made.
★★★★	Efforts are being made and are regularly checked and directions have been provided to the area and facilities where soil contamination is expected.
★★★★★	Efforts are being made and are regularly checked and directions have been provided to the area and facilities where soil contamination is expected. Furthermore, actual goals to prevent soil contamination have been established.

■ Remarks

- Assess the investigations to grasp the condition and standard for judgment of soil contamination in municipalities where evaluation targeted area is located. In addition, assess the information disclosure in the case of going beyond the criteria and efforts to deal with soil contamination such as soil improvements.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

3-5. Governance

13. Policy Framework

13.1. Efforts toward a Low-Carbon Town

Assess the various efforts and systems to create a low-carbon town.

13.1.1. Policies/Business Plans to Create Low-Carbon Town

Assess policies, plans and goals related to the creation of a low-carbon town.

★	There are no policies, plans or goals. However, a system for their formulation has been established.
★★	There are no policies, plans or goals. However, a system for their formulation has been established, and prospects of developing plans and goals are clear.
★★★	There are policies, plans and goals.
★★★★	There are policies, plans and goals. Furthermore, there are cooperation between national and sub-national governments.
★★★★★	There are policies, plans and goals and actual efforts to carry out the plans and achieve the goals have been made.

■ Remarks

・ Assess efforts that consider a low-carbon town in municipalities or development agencies in the targeted area.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies include administrative or private developers, etc.

・ Regarding efforts, the following items should be considered.
- Assistance in creating a low-carbon town guidebook
- Creation of an approximation method of CO_2 emissions
- Countermeasures against global warming
- Support for development of policies related to a low-carbon town
- Creation of educational programs and systems for practices and awareness that promote a low-carbon town
- Campaign to broaden efforts toward a low carbon town, etc.

*Educational system refers to matters which contribute to a low-carbon town through educational activities, such as contributing to the reduction of CO_2 by eco-driving.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

13.1.2. Budget for Policies/Business Plans to Create Low-Carbon Town

Assess various business budgets related to the creation of a low-carbon town

★	Budgets have not been secured. However, a system has been established for the development of policies, plans and goals.
★★	—
★★★	Budgets have been secured.
★★★★	—
★★★★★	Budgets have been secured and efforts, such as writing newsletters, have been performed to promote wider use.

■ Remarks

- Assess the securement of a budget developed and planned by municipalities or development agencies in the target area for various efforts to achieve related to a low-carbon town.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies include administrative or private developers etc.

- Regarding evaluation rank 1 (★), assess according to '13.1.1 Policy for Lower Carbon/Project Plan'.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

13.2. Efforts toward Sustainability

Secure safety and consider environmental friendliness through development that is less affected by natural disasters, blackouts, etc.

13.2.1. Business Continuity Plan (BCP)/Life Continuity Plan (LCP)

Assess the BCP/LCP, disaster prevention and response measures, etc.

★	There are no plans. However, a system for their formulation has been established.
★★	There are no plans. However, a system for their formulation has been established and prospects for their development are clear.
★★★	There are plans.
★★★★	There are plans that have been established in some parts of the area.
★★★★★	There are plans that have been established in more than half of the area.

■ Remarks

- Assess the presence or absence of development of plans and the establishment situation regarding LCP ad BCP by municipalities or development agencies in the targeted area.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies include administrative or private developers etc.

- The establishment situation of LCP/BCP shall follow the criteria set by each economy.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

13.2.2. Developments with Less Impact on Natural Environment

Assess regulations that consider the geographical characteristics and changes, etc.

★	There are no regulations. However, a system for their formulation has been established.
★★	—
★★★	There are regulations.
★★★★	There are regulations, and development based on the regulations is underway.
★★★★★	There are regulations, and development based on the regulations has been completed.

■ Remarks

- Artificial change of the natural geography refers to cases where continuous geography becomes discontinuous space due to development, such as placement of retaining walls.
- Regulations are, for example, conservation of the natural geography, etc. by the development activities.
- Regarding efforts such as regulations, plans by the municipalities or development agencies are assessed.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies refer to administrative or private developers etc.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

14. Education & Management

14.1. Life Cycle Management

Assess efforts, such as enlightenment and education, for energy-savings and a low-carbon town.

14.1.1. Enlightenment and Education for Energy-savings and a Low-carbon Town

Assess efforts in educational activities, enlightenment and education targeting students and local residents.

★	No efforts are being made. However, a system for their formulation has been established.
★★	No efforts are being made. However, a system for their formulation has been established and prospects for their establishment are clear.
★★★	Efforts are being made.
★★★★	—
★★★★★	Efforts are being made and plans/pledges by implementation agencies, budgets etc. for continuous management have been established.

■ Remarks

- Enlightenment and education, such as training, etc. to assist each member of society to become aware of the importance of energy-savings and carry out environmental conservation activities for energy-savings and lower carbon activities in daily life and business are assessed.
- All activities that contribute to lower carbon use are targeted, such as turning off unnecessary lights, reduction of standby electricity consumption (unplug) and education in eco-driving.
- Formulation of efforts and budget securement by municipalities or development agencies are targeted.

*Assessment of measures developed by the smallest administrative district (ward or town) of the local government is prioritised. However, assessment targets also include efforts at the prefecture level.
*Development agencies refer to administrative or private developers etc.

- Agencies carrying out enlightenment and education shall target government, development agencies, community associations, area management organisations, private enterprises etc.

*Area management organisations refer to town assemblies, merchants'

associations and other community associations, etc.

- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

14.1.2. Area Management toward Energy-saving and Low-Carbon Town

Assess community associations and area management organisations.

★	There are no community associations or area management organisations in the area. However, a system has been established for the formulation of such organisations.
★★	There are no community associations or area management organisations in the area. However, a system has been established for the formulation of such organisations and prospects for their establishment are clear.
★★★	There are some community associations or area management organisations in the area.
★★★★	There are some community associations or area management organisations in the area and plans/pledge, such as promotion agencies for continuous administration and funds, have been established.
★★★★★	There are some community associations or area management organisations in the area and cooperative systems, such as regional community organisations around the area, are established or planned.

■ Remarks

- Community associations and area management organisations refer to town assemblies, coalition town meetings, merchant associations and other community associations, etc., and the organisers can be residents, enterprises or governments.
- As actual examples of ‘plans/pledge for continuous administration and funds,’ officials /expert members are selected and their terms of office have been set for continuous activities, conferences have been established and are regularly held, regulations have been set, appropriate account dealings have been

made such as budget decision through voting by the entire committee, etc.

- Furthermore, cooperative systems, such as regional community organisations around the area, shall include, for example, networks that have been made with other area management organisations outside the area, including community associations, with awareness of the direction of the entire area, as an effort to a low-carbon town, global environmental problems, BCP/ LDP.
- As for evaluation rank 1 (★), even if the system has not been established yet, the same level evaluation can be obtained as long as they have secured personnel, such as officials in charge and experts, with the intent to establish the system.

*Prospects indicate that formulation of plans is to be completed within a certain period of time (approximately one to three years).

*Referred to CASBEE (CASBEE for Urban Development – 2.1.2 Area management).

4. Calculation Method of the Amount of CO_2 Emissions

Regarding efforts to create a low-carbon town, quantitatively assess CO_2 emissions.
The calculation method is according to the calculation criteria of each economy, but for economies that do not have a regulated calculation method, the following guideline can be used as an example.

- Using the guideline regulated by Intergovernmental Panel on Climate Change (IPCC)
http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

- Using the standard 'ISO14064' regulated by International Organization for Standardization (ISO) about estimate, report and verification of greenhouse gas (GHG) emissions and reductions.
http://www.iso.org/iso/catalogue_detail?csnumber=38381
*no need to do verification process (ISO 14064-3)

Reference: Simplified Assessment Method for economies that do not have an assessment method.
The following method is a simplified calculation method. Since this is an abbreviated calculation, it is only recommended for tentative use.

Chart 1: Calculation Example of CO_2 Assessment

CO_2 Assessment Calculation Example (based on the Low-Carbon City Development Guidance, Ministry of Land, Infrastructure, Transport and Tourism)

Category	Assessment Target and Calculation Method
Industry Civil	CO_2 emissions from energy consumption associated with production activities in the manufacturing, agriculture/forestry/fisheries, mining, and construction industries. CO_2 Emissions= (Total floor area of buildings by use) × (CO_2 emission intensity of buildings by use)× (1- Overall CO_2 reduction rate)

Table: Setting of an annual CO_2 emission basic unit by building use

Building Use		Number of materials	Primary energy consumption	Primary energy component ratio (%) by energy type			CO_2 emission basic unit	Converted basic unit
		2003	MJ/m²/year	Electricity	Gas	Other	kg-CO_2/m²/year	kg-CO_2/MJ
Office	(Office)	558	1,936	87	11	1	108.98	0.0563
School		28	1,209	87	9	3	68.53	0.0567

	Retail Store	(Department store, supermarket)	20	3,225	92	7	1	182.28	0.0565
	Restaurant	(Department store)	28	2,923	89	10	1	164.57	0.0563
	Meeting Place	(Office)	188	2,212	80	14	6	125.46	0.0567
	Hospital	(Hospital)	45	2,399	67	15	18	139.15	0.0580
	Hotel	(Hotel)	50	2,918	66	19	15	167.47	0.0574
	Detached Housing	(Residence)						36.0	
	Housing Complex	(Residence)						29.5	

Note: Terms in parentheses indicate building categories that were used in (3) (2): Ratio of energy consumer by use.

Source: CO_2 emission basic units related to the following are used: (other than housing) Comprehensive Assessment System for Built Environment Efficiency (CASBEE for New Construction, 2008 edition)

(housing) CASBEE for Home (Detached House) and CASBEE for New Construction (Housing Complex)

Source: Low Carbon City Development Guidance (Materials)

Transport

■ Method to use Person Trip Survey data

<CO_2 emissions from automobiles and busses>

CO_2 emission = Traffic volume × Distance travelled × Emission intensity

Average traveling speed (km/h)	CO_2 Emission Basic Unit (g-CO_2/km/car)	
	Small Vehicle (passenger car and small freight car)	Large Vehicle (regular freight car and bus)
5	547	2,110
10	342	1,515
15	269	1,277
20	229	1,133
25	204	1,042
30	186	963
35	172	894
40	161	836
45	152	788
50	146	750
55	141	723
60	138	706

65	137	700
70	137	705
75	139	719
80	142	744
85	146	780
90	152	826

Source: Low Carbon City Development Guidance (Materials), Administrative Circular on the 'Method for calculating quantitative assessment indicators among objective assessment indicators' (November 25, 2003), Ministry of Land, Infrastructure, Transport and Tourism

< CO_2 Emissions from Railroad>

CO_2 Emissions (g) = Σ (Railroad OD traffic volume (person) x distance between OD (km) x CO_2 emission basic unit (g/person/km)

(Reference) Emission basic unit: 28 g-CO_2/person/km (A list of emission coefficients in the Directory of transportation-related energy and in the Order for Enforcement of the Act on Promotion of Global Warming Countermeasures, Article 3 (partially amended on 24 March 2006))

■ Method to use Road Traffic Census data

CO_2 Emissions (g) = Σ CO_2 emissions by OD (g) = Σ (Σ (OD traffic volume by vehicle type (vehicle) x distance been OD (km) x CO_2 emission basic unit by vehicle type (g/vehicle/km))

(Reference) CO_2 emissions are estimated from fuel consumption:

CO_2 Emissions (tCO_2) = Fuel consumption (kl) x 1,000 x calorific value (MJ/l) ÷ 1,000,000 x carbon emission coefficient (tC/TJ) x 44/12

(Reference) Carbon emission coefficient

Type	Calorific Value	Emission Coefficient	CO_2 Emission
Gasoline	34.6 (GJ/kl)	0.0183 (tC/GJ)	2.32 (tCO_2/kl)
Light Oil	37.7 (GJ/kl)	0.0187 (tC/GJ)	2.58 (tCO_2/kl)

Source: Calculation methods and a list of emission coefficients in calculation, reporting, and publication system (after amendment in March 2010) (Ministry of the Environment)

Absorption

■ CO_2 absorption by forests

CO_2 Absorption (tCO_2) = Forest area x basic absorption unit

(Reference) Basic absorption unit: 2.92 (tCO_2/year/ha). Source: National Greenhouse Gas Inventory Report of Japan 2010, National Institute for Environmental Studies

	■ Support for CO_2 emission control in other regions (emissions trading and others) Post the amount purchased.

Source: Quoted from CASBEE for Cities (2012), Low Carbon City Guidance: Materials, and the Concept of the Low-Carbon Town in the APEC Region Second Edition October 2012

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