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APEC LOW-CARBON TOWN INDICATOR (LCT-I) SYSTEM

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APERC
Asia Pacific Energy Research Centre

APEC
Asia-Pacific Economic Cooperation

Key Activities of LCMT Project (Phase 1-6)

1. **Development and refinement of the "Concept of the Low-Carbon Town in the APEC Region (Concept)"**
   - **The Concept shows a basic idea/principle of a low-carbon town and provide guidance.**
   - **The APEC Low-Carbon Town Indicator (LCT-I) System has been developed based on the Concept.**

2. **Feasibility Study for a Case Town**

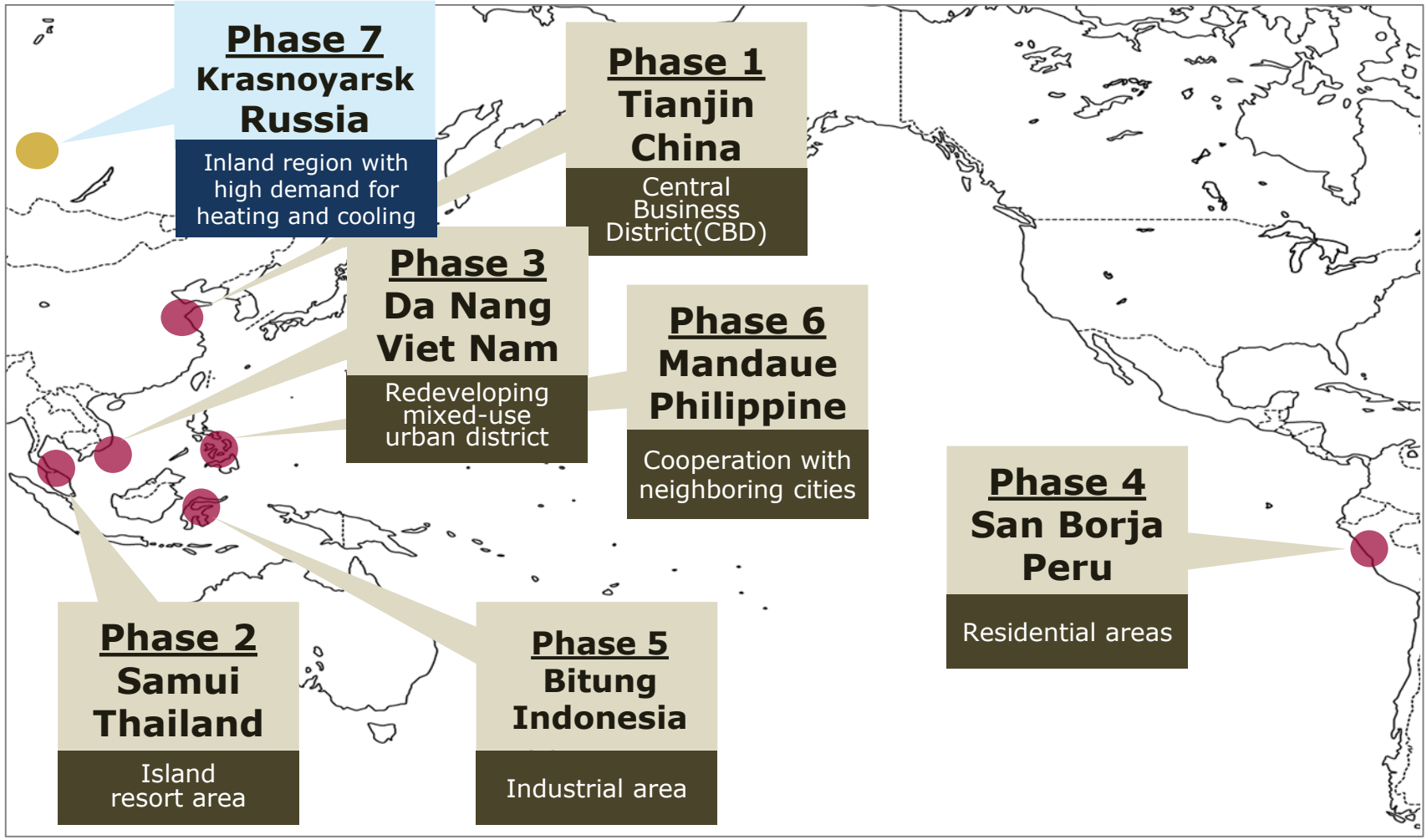
3. **Policy Review for a Case Town**

Preliminary Research for the LCT-I System

	Concept: Cities Surveyed in Phase 1- 6	Feasibility Study / Policy Review: Case Towns in Phase 1- 6
Phase 1	**Da Nang**, Viet Nam; **Surabaya**, Indonesia; **Cebu**, The Philippines; **Putrajaya**, Malaysia; and **Tianjin**, China	**Yujiapu, Tianjin**, China Greenfield development of central business districts (CBD) of a large city
Phase 2	**Samui Island**, Thailand; **Penghu Island**, Chinese Taipei; and **Da Nang**, Viet Nam	**Samui Island**, Thailand Development on an island resort
Phase 3	**Portland**, The US and **San Borja**, Peru	**Da Nang**, Viet Nam Redevelopment of an existing city
Phase 4	**Vancouver**, **Calgary**, and **Toronto** in Canada; and **Philadelphia**, The US	**San Borja**, Peru Residential area in a city
Phase 5	**Adelaide** and **Melbourne** in Australia; **Auckland** and **Palmerston North** in New Zealand; and **Santiago**, Chile	**Bitung**, Indonesia Industrial area in a city
Phase 6	**Yongin** and **Jincheon** in Korea; **Krasnoyarsk**, Russia; and **Yokohama** and **Kashiwa** in Japan	**Mandaue**, The Philippines Low-carbon development plans in cooperation with neighbouring cities

Development of LCT-I System

Case Towns of Feasibility Study and Policy Review



Sixth Edition of the Concept

The Concept aims to promote the development of LCT in the APEC region by providing a basic principle that can assist the central and local government officials in planning effective low-carbon policies and in formulating an appropriate combination of low-carbon measures while taking socio-economic conditions and city-specific characteristics into consideration.

The Sixth Edition of the Concept* consists of:

1. **Executive Summary** (3 pages)
2. **Volume I: Main Chapter** (72 pages)
3. **Volume II: Low-Carbon Measures** (81 pages)

- **The 1st-6th Editions of the Concept are available at:**

  http://aperc.ieej.or.jp/publications/reports/lcmt.html

- **The Sixth Edition is the final.**

Volume I: Main Chapter

- **Chapters in Volume I**

1	Background and Achievement to Date
2	APEC Low-Carbon Town and its Concept
3	Basic Approach to Develop the Low-Carbon Town
4	Characterisation of Towns and Low-Carbon Measures
5	Measures Applicable to the Development of Low-Carbon Town
6	Evaluating the Effect of Low-Carbon Measures

Volume II: Low-Carbon Measures

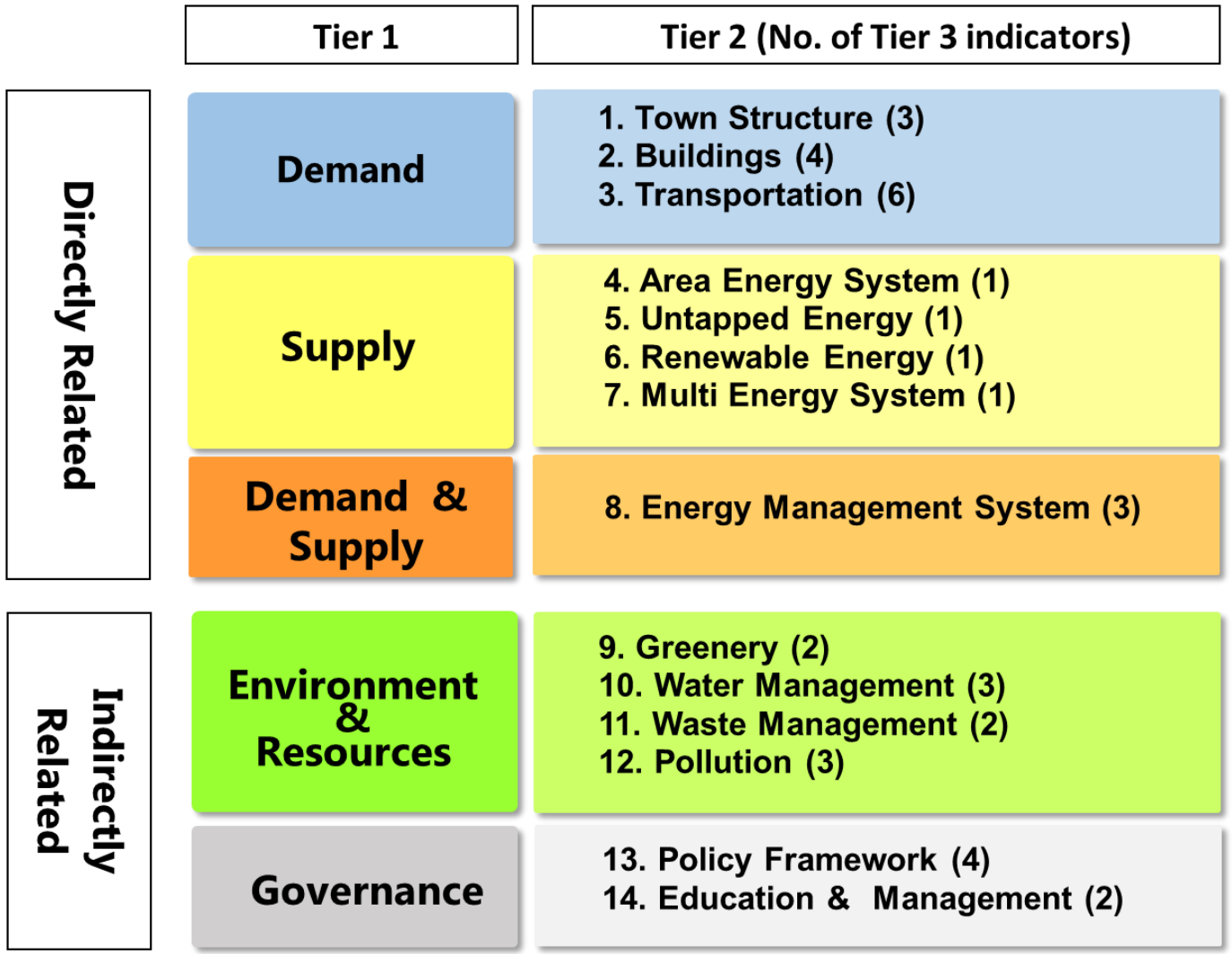
- **Volume II includes:**
  - **Low-Carbon Measures and Their Applicability**
  - **Low-Carbon Measures with Case Examples**

(1) Cogeneration System/Combined Heat and Power/Trigeneration	(11) Hydroelectric Power Generation	(21) Electrically Driven Vehicle
(2) Using Sea/River Water	(12) Waste Heat from Incineration Plants	(22) Infrastructure for Electrically Driven Vehicle
(3) District Heating and Cooling (DHC)	(13) Solar Power Generation	(23) Community Cycle Sharing
(4) Sunlight Reflection, Shading and Thermal Insulation	(14) Solar Heating & Cooling	(24) Smart Grid
(5) Façade Engineering	(15) Biomass Power Generation	(25) Community Energy Management System
(6) Natural Ventilation	(16) Geothermal Power Generation	(26) Home Energy Management System
(7) Daylight Use plus Lighting System	(17) Wind Power Generation	(27) Factory Energy Management System
(8) Hybrid of Natural Ventilation plus Air Conditioning	(18) Fuel Cell	(28) EV Charging Management Solution
(9) High-efficient Heat or Cooling Source plus Thermal Storage	(19) Transportation (Establishment of Public Transportation Network)	(29) Demand Side Management
(10) Waste Heat from Sewage Treatment Plant	(20) Local Transportation System (Bus, LRT, etc.)	(30) Simulation Results for CO2 Emission Reduction (Central TOKYO 7 Wards Area)

Characteristics of LCT-I System

- **A self-assessment tool to assess and monitor the progress of each LCT development project (not for comparison).**
- **It is supposed to be used by central and local government officials.**
- **Designed to be as simple as possible with user-friendliness in mind.**
- **Users can carry out an assessment with the attached LCT-I evaluation sheet.**
- **The assessment areas of the LCT-I System are comprehensive and uses a five point scale evaluation in principle.**
- **APEC's liaison officer had attended meetings of ISO/TC268 on Sustainable Cities and Communities since February 2015 to maintain the LCT-I System relevant to global standards developed by ISO.**

Assessment Framework of LCT-I System



Indicators of LCT-I System: Demand

Tier 1	Tier 2	Tier 3
Demand	Town Structure	➢ **Adjacent Workplace and Residence** ➢ **Land use** ➢ **Transit Oriented Development (TOD)**
	Buildings	➢ **Energy Saving Construction** ➢ **Green Construction**
	Transportation	➢ **Promotion of Public Transportation** • Easy-to-Use Public Transportation • Comprehensive Transportation Measures ➢ **Improvement in Traffic Flow** • Transportation Demand Management (TDM) • Transportation Infrastructure Planning ➢ **Introduction of low carbon vehicles** ➢ **Promotion of Efficient Use** • Support for Eco-driving

Indicators of LCT-I System: Supply, Demand & Supply

Tier 1	Tier 2	Tier 3
Supply	Area Energy System	➢ Area Energy System
	Untapped Energy	➢ Untapped Energy
	Renewable Energy	➢ Renewable Energy
	Multi-Energy System	➢ Multi-Energy System
Demand & Supply	Energy Management System	➢ Energy Management of Buildings/Area • Energy Management System (EMS) • Area Energy Management System (AEMS) • Smart Micro-Grid

Indicators of LCT-I System: Environment & Resources

Tier 1	Tier 2	Tier 3
Environ-ment & Resources	**Greenery**	➢ **Securing Green Space** • Formation of Green Shade • Formation of Greening
	Water Management	➢ **Water Resources** • Water Usage • Water Reuse - Rainwater Use - Recycled Wastewater Use
	Waste Management	➢ **Waste Products** • Reduction of Waste Products • Reuse of Waste Products
	Pollution	➢ **Air Pollution** ➢ **Water Pollution** ➢ **Soil Pollution**

Indicators of LCT-I System: Governance

Tier 1	Tier 2	Tier 3
Gover-nance	**Policy Framework**	➢ **Efforts toward a Low-Carbon Town** • Policies/Business Plans to Create Low-Carbon Town • Budget for Policies/Business Plans to Create Low-Carbon Town ➢ **Efforts toward sustainability** • Business Continuity Plan (BCP)/Life Continuity Plan (LCP) • Developments with Less Impact on Natural Environment
	Education & Management	➢ **Life Cycle Management** ➢ **Area Management toward Energy-Saving and Low-Carbon Town**

Sample of Qualitative Indicator

8. Energy Management

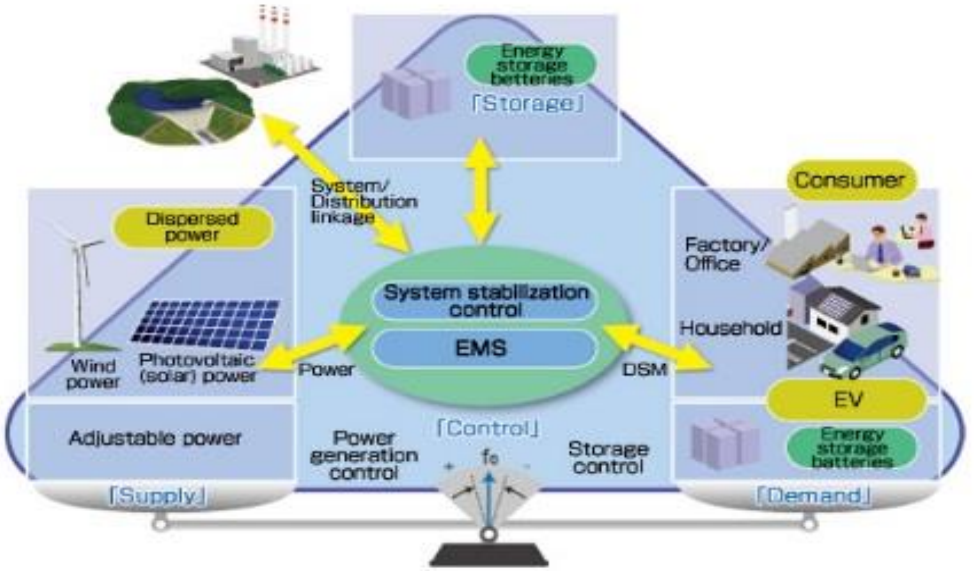
8.1. Energy Management of Buildings/Area

8.1.1. Energy Management of Buildings/Area

★★★★★	
★	There are no plans for introduction in place. However, a system for introduction has been established.
★★	There are no plans for introduction in place. However, a system for introduction 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, a subsidy system, etc. for expansion of implementation has been established.

Assess the presence or absence of EMS introduction plans.

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.



Sample of Quantitative Indicators

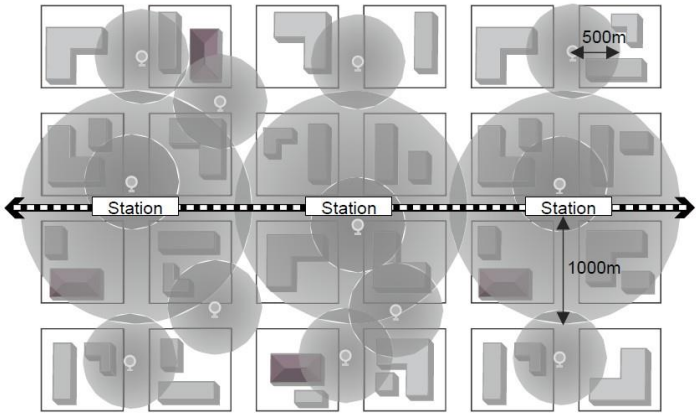
3. Transportation

3.1. Promotion of Public Transportation

3.1.1. Easy-to-Use Public Transportation

★★★★★	
★	30% or less of the target area is covered.
★★	30% to 50% of the target area is covered.
★★★	50% to 70% of the target area is covered.
★★★★	70% to 90% of the target area is covered.
★★★★★	90% or more of the target area is covered.

Image of Walking Distance from Stations and Bus Stops



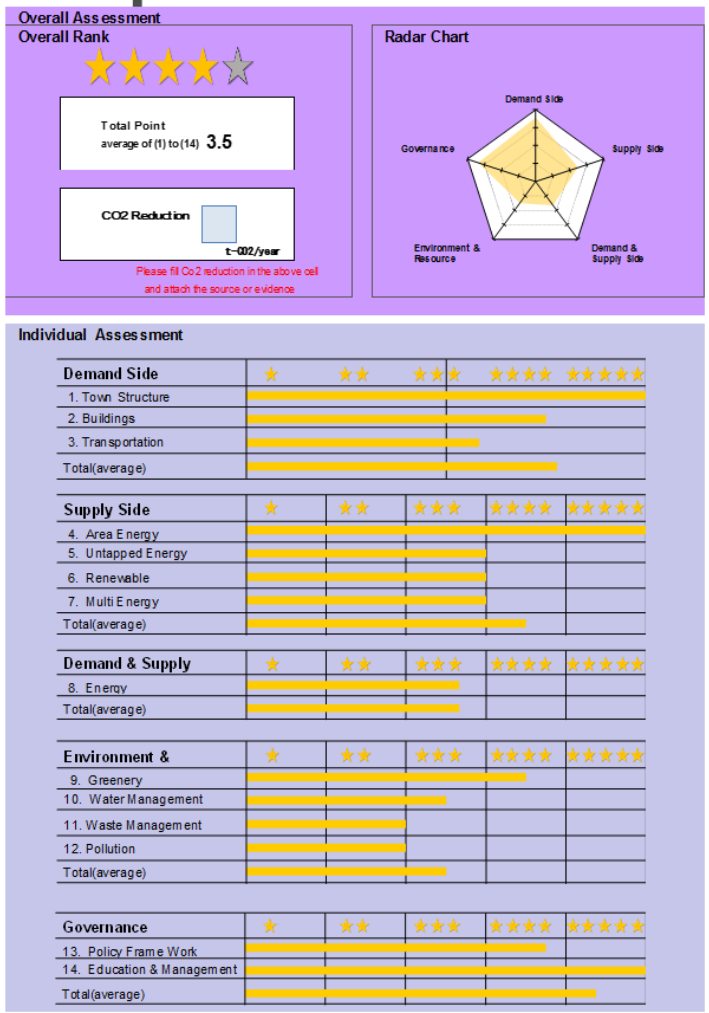
Assess the coverage ratio of the areas of walking distance from the train stations and bus stops to the target area.

Coverage ratio refers to the proportion of range (area of a circle) with a radius of 500m-1000m, centering 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)

Image of Evaluation Results

Output Sheet 1



Output Sheet 2

evaluation sheet				
		★★★		3.5
Demand Side		★★★★		4.6
1. Town Structure	-			
1.1. Adjacent Workplace and Residence	-			
1. Residential Use and Non-residential Use	★★★★★		5	
1.2. Land Use	-	★★★★★		5.0
1. Efficient Land Use	★★★★★		5	
1.3. TOD (Transit Oriented Development)	-			
1. City Development Centered on Public Transportation	★★★★★		5	
2. Buildings	-			
2.1. Energy Saving Construction	-			
1. Thermal Insulation Performance	★★★★★		5	
2. Energy Saving Equipment Performance	★★★★★	★★★★	5	4.5
3. Natural Energy	★★★★		4	
2.2. Green Construction	-			
1. Green Construction Guidelines	★★★★		4	
3. Transportation	-			
3.1. Promotion of Public Transportation	-			
1. Easy-to-Use Public Transportation	★★★★★		5	
2. Comprehensive Transportation Measures	★★★★★		5	
3.2. Improvement in Traffic Flow	-			
1. TDM(Transportation Demand Management)	★★★★★	★★★★	5	4.2
2. Transportation Infrastructure Planning	★★★★★		5	
3.3. Introduction of Low Carbon Vehicles	-			
1. Introduction of Low Carbon Vehicles	★★★★★		5	
3.4. Promotion of Efficient Use	-			
1. Support for eco-driving	-		0	
Supply Side		★★★		3.5
4. Area Energy System	-			
4.1. Area Energy	-	★★★★★		5.0
1. Introduction of Area Energy	★★★★★		5	
5. Untapped Energy	-			
5.1. Untapped Energy	-	★★★		3.0
1. Introduction of Renewable Energy	★★★		3	
6. Renewable Energy	-			
6.1. Renewable Energy	-	★★★		3.0
1. Introduction of Renewable Energy	★★★		3	
7. Multi Energy System	-			
7.1. Multi Energy	-	★★★		3.0
1. Introduction of a Multi Energy system	★★★		3	
Demand & Supply Side		★★		2.7
8. Energy Management	-			
8.1. Energy Management of Buildings/Area	-			
1. Energy Management of Buildings/Area	★★★★	★★	4	2.7
2. AEMS (Area Energy Management System)	★★★★		4	
3. Smart Micro Grid	-		0	

Resources for CO2 emissions calculation

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.

- Intergovernmental Panel on Climate Change (IPCC)

  http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

- '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)

- Simplified method is also explained with a quote from CASBEE for Cities in the LCT-I System Guideline.

Thank you for your kind attention

The LCT-I System Guideline:
http://aperc.ieej.or.jp/publications/reports/lcmt/LCT-I_System_Guideline.pdf
Evaluation Sheet:
http://aperc.ieej.or.jp/publications/reports/lcmt/LCT-I_Evaluation_sheet_first_edition_rev2.xls

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