

Hiroshima City Action Plan for Global Warming Countermeasures

~ Towards a resilient, sustainable, low-carbon and energetic Hiroshima ~

Executive Summary

Chapter 1: Trends concerning global warming

1. What is global warming?

Global warming is caused by the increase of greenhouse gas emissions such as carbon dioxide associated with the mass consumption of oil, coal, and other fossil fuels.

2. Current status of global warming and its effect

The progression of global warming is becoming more serious and if additional global warming countermeasures are not taken, the temperature is likely to increase 2.6 - 4.8 degrees Celsius by the end of this century.

Further, even when the maximum possible measures are taken, the effects of climate change due to global warming cannot be avoided.

3. International trends

- In 2015, the Paris Agreement was adopted at “The 21st session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change” in Paris, which created a new international framework for all countries, which replaced the Kyoto Protocol. It features the point of controlling the increase in the average global temperature to less than 2 degrees C compared to that of before the Industrial Revolution, and an Adaptation Plan for adapting to the climate change, a mutual complementary strategy for “mitigation measures.”
- The conditions for the Paris Agreement to take effect were that more than 55 countries ratify the agreement and that the total amount of greenhouse gas emissions from these ratifying countries be more than 55% of the total amount of the global emissions. These conditions were met and the Paris Agreement came into force in November 2016.

4. Measures taken by Japan

- Based on the Paris Agreement, etc., the Global Warming Prevention Plan was prepared in May 2016.
- In July 2016, the preparation of a Long-term Low-carbon Vision began with the aim of an 80% reduction by FY2050.
- The Paris Agreement was ratified in November 2016.

Timeframe	Base Year	Target Year	Reduction Target
Long-term Goals	—	FY2050	80%
Mid-term Goals	FY2013	FY2030	26%
Short-term Goals	FY2005	FY2020	More than 3.8%

Chapter 2: Current status of our city

1. Achievement status of the greenhouse gas reduction target in the previous plan

In order to achieve the goal, “6% reduction of greenhouse gas emissions compared to FY1990” set in the old plan, our city has developed various measures such as the establishment of the “Hiroshima City regulation concerning the promotion of global warming prevention, etc.”, introduction of a plan system using a regulatory method based on this regulation, and the provision of subsidies for introducing a solar power system, etc.

However, our country’s energy policy had to be revised due to the nuclear power station accident caused by the Great East Japan Earthquake, resulting in the shut-down of the nuclear power station and the increased CO2 emission factor of electric power suppliers. Further, with the increase in population/household and economic recovery, energy use by the consumer/household sector and the consumer/business sector such as offices and shops, etc., increased and the targeted reduction was not achieved.

2. Current status of climate change

(1) Current status

- The average temperature increased by 1.51 degrees C in 100 years (statistic data: 1879-2012) with an increasing number of extremely hot days and decreasing number of frost days. This is causing impacts such as the early bloom of cherry blossoms and the increase of heatstroke patients.
- Although the annual amount of rainfall has not shown a significant long-term change in trends over a 100-year period (statistic data: 1879-2012), the number of days with rainfall of more than 30mm/h in a year slightly increased since the 1980s. Due to this trend, the risk of disasters such as landslides is increasing.

(2) Future projection

- According to the estimation of atmospheric concentration of greenhouse gases at the end of the 21st century (approximately 700 ppm that is about 1.8 times more than the current value) in the Global Warming Projection No.8 published by the Japan Meteorological Agency in March 2013, it is projected that the annual average temperature will increase by 2.5–3.5 degrees C with a nationwide increase in the number of extremely hot days and the frequency of downpours with more than 50mm/hour of rainfall, etc., will also increase nationwide.
- The Hiroshima Local Meteorological Observatory also projects that the annual average temperature will increase by approximately 3 degrees C and the number of days with more than 100mm/hour rainfall will increase, etc., at the end of the 21st century.

3. Issues to be solved

- In order to further promote global warming prevention, measures that revise and overcome the current social economic structures, in which urban development (population/household increase and economic growth, etc.) is linked with the increase of greenhouse gas emissions, are required.
- The effect of climate change due to global warming is becoming apparent even in the city; the relationship between the heavy rain and the disaster in Hiroshima in August 2014 and climate change due to global warming is suggested. It is necessary to appropriately handle the obvious effects as well as prepare for the effects that may actualize in the future.

Chapter 3: Basics of this plan

1. The idea

A new global warming prevention plan should be developed based on the international framework, state actions and current status of our city, as it is an important and urgent issue concerning the foundation of human survival.

2. Positioning

This plan has been developed to deal with the countermeasures (mitigation) to prevent global warming, and to adapt (Adaptation Plan) to the effects of climate change due to global warming, defined in the "Act on Promotion of Global Warming Countermeasures." It also plays roles in the following plans:

- "Local Government Action Plan (District Measures Version/Administration Version)" based on the Act on Promotion of Global Warming Countermeasures"
- "Adaptation in Region" in the "National Plan for Adaptation to the Impacts of Climate Change"
- "Action Plan" concerning the prevention of global warming in the "Hiroshima City Second Basic Environment Plan"

3. Types of greenhouse effect gases and forest absorption source

- 7 types of gas including "carbon dioxide", "methane", "dinitrogen monoxide" and "4 gases such as chlorofluorocarbon (CFC) alternatives"
- By preparing this plan, the amount of gas absorbed by forests is included in the reduced amount of the greenhouse effect gases.

4. Base year and targeted year of greenhouse gas emission reduction target

Timeframe	Base Year	Targeted Year
Long-term Goals	FY2013	FY2050
Mid-term Goals	FY2013	FY2030
Short-term Goals	FY2013 (2005)	FY2020

* FY2005 is included as reference in the short-term goals to compare with the base year of the national plan.

Chapter 4: The city Hiroshima aims to become

1. Basic concept

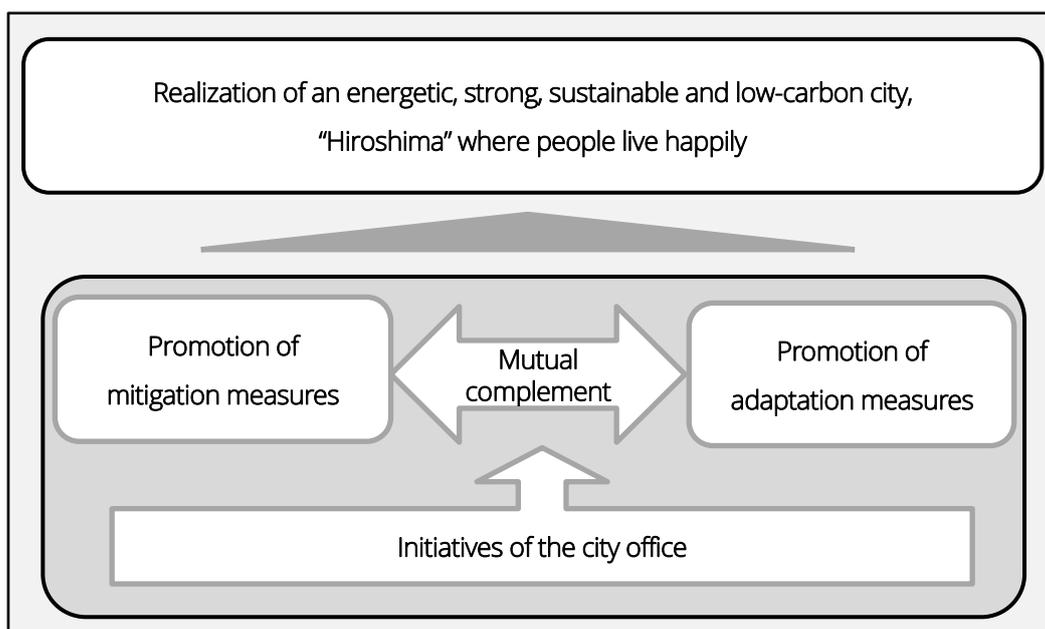
Based on our long-term vision “Hiroshima Carbon Minus 70”, we established the ideal city that Hiroshima aims to become from the following 5 viewpoints:

1. Shifting to environmentally-friendly energy sources, the city will change into a compact city structure that enables environmentally-friendly life and business styles and low-energy consumption.
2. The city will be able to appropriately adapt to changes in the social and economic environment such as economic growth, enhancement of social welfare, i.e., creating a comfortable daily life and convenient city, etc., and population decline, etc.
3. As a city globally-renowned for its efforts to promote peace, the city will contribute to counteracting global warming issues, which is also one of the common issues for all humanity, by collaborating with domestic and international cities.
4. The city will minimize and/or avoid the effect of climate change due to global warming, and acquire the strength to maintain and smoothly recover the city functions even at the time of disasters.
5. The city will inherit and pass on our rich natural environment of green and water to the next generation, while living in harmony with nature.

2. The city Hiroshima aims to become

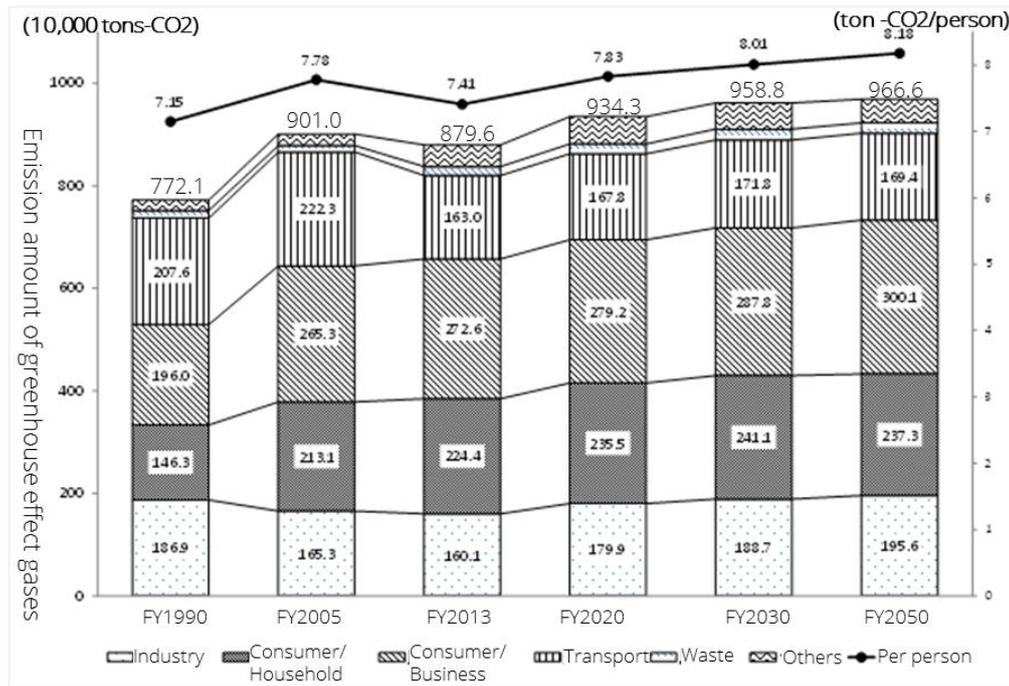
The city that Hiroshima aims to become is an energetic, strong, sustainable and low-carbon city, “Hiroshima” where people live happily.

For its realization, as shown in the diagram below, the city office takes the initiatives, promotes actions by citizens and businesses and collaborates with all stakeholders to promote the counteractions against global warming (mitigation measures) as well as adapting to the effect of climate change due to global warming (adaptation measures).



Chapter 5: Promotion of counteractions against global warming (Mitigation)

1. Estimation of future greenhouse gas emissions



The city's future estimation values of the greenhouse gas emission amount are 9,343,000 tons in FY2020, 9,588,000 tons in FY2030 and 9,666,000 tons in FY2050 that are all estimated to increase compared to FY2013 against the background of economic growth, etc.

(N.B.) Industry, Consumer/household, Consumer/business, Transport and Waste sectors show the CO2 emission by sector; others show the total emission amount of methane, dinitrogen monoxide and 4 gases such as chlorofluorocarbon (CFC) alternatives.

2. Reduction target for greenhouse gas emissions

To establish the reduction target of greenhouse gas emissions, the city will set the long-term target based on the national government's target, keeping in mind the city Hiroshima aims to become. This will follow by the mid-term and short-term targets increasing the reduction effect estimated from concrete measures, etc.

(Unit: 10,000 tons-CO2)

Timeframe	Target Year	Reduction Target (Total Target Amount)	Estimated Amount A	Target Amount B	Estimated Reduction Amount A-B
Long-term Target	FY2050	Compared to FY2013 ▲80%	967	176	791
Mid-term Target *1	FY2030	Compared to FY2013 ▲30%	959	616	343
Short-term Target *2	FY2020	Compared to FY2013 ▲5% (Compared to FY2005 ▲7%)	934	836	98

*1 Setting of targets by sectors in the mid-term target

Apart from the total target amount, we set the targets by sector as follows:

- Carbon Dioxide: Industry sector ▲7%, Consumer/household sector ▲40%, Consumer/business sector ▲40%, Transport sector ▲28%, Waste ▲6.7%
- Methane ▲12.3%
- Dinitrogen monoxide: ▲6.1%
- 4 gases such as chlorofluorocarbon alternatives: ▲25.1%

*2 Setting of short-term energy reduction target

Total amount of energy use that is not affected by the carbon dioxide emission factor of electric utility

- Total amount of energy use: ▲5%

3. Direction of measures for achieving the reduction target

In order to achieve the vision for Hiroshima, the direction of measures is restructured into the following 4 pillars based on the direction defined by "Hiroshima Carbon Minus 70" for clarifying the direction, prioritizing measures and promoting "solidarity between cities," which is becoming the international mainstream of global warming countermeasures.

Basically, until the deadline of the short-term targets in FY2020, the actions will focus on the first and second pillars to build a foundation for the type of city Hiroshima aims to become. Meanwhile, systems necessary for the third and fourth pillars will be prepared.

From FY2020, based on the development of the first and the second pillars, the focus will move on to the third and fourth pillars, realizing the city Hiroshima aims to become by FY2050.

THE FIRST PILLAR: PROMOTION OF DEVELOPMENT OF ENVIRONMENTALLY-FRIENDLY PEOPLE AND OFFICES (CHANGE OF VALUES)

To encourage all agents including citizens and business operators to adopt measures to counteract global warming, it is essential to enhance each person's value for countermeasures against global warming, in addition to creating the common acknowledgement concerning global warming.

The first pillar is, therefore, the "Promotion of development of environmentally-friendly people and offices" that is to enhance citizens' and business operators' mindset and understanding about global warming in order to achieve a change of values.

THE SECOND PILLAR: PROMOTION OF LARGE-SCALE INTRODUCTION OF INNOVATIVE TECHNOLOGY (CHANGE OF ACTION)

Even when each action taken by a citizen is small, e.g., energy saving, etc., cumulatively these actions lead to the global warming prevention at a global scale. Therefore, it is necessary not only to enhance environmental values for global warming prevention, but also that each citizen takes concrete actions prioritizing the environment based on such values.

The second pillar is, therefore, with the aim of change in action, the "Promotion of large-scale introduction of innovative technology" that promotes actions contributing to the reduction of carbon emissions in daily life and social economic activities by citizens and business operators.

THE THIRD PILLAR: PROMOTION OF DEVELOPMENT OF LOW-CARBON CITY (CHANGE OF SOCIAL SYSTEM)

The third pillar is the "Promotion of development of a low-carbon city" that promotes the development of a low-carbon city according to local characteristics, in cooperation with many agents aiming for a change in the social system, based on the following 3 points:

1. Many private buildings such as houses and commercial buildings in the city area were built in the period of rapid economic growth around 1965-1975, and are now facing a time of renewal or large renovation. At this timing, it is necessary to plan and shift to a low-carbon, compact city structure with small energy consumption.
2. Facing the country's population decline and advancing super-aging society, our city needs to support research and development in the environment-related fields leading to innovation and to aim at a shift in business style in order to continue our development as a central city leading the development of the Chugoku and Shikoku regions.
3. It is necessary to shift our lifestyle with all local agents cooperating and taking initiatives for developing low-carbon communities, etc., under the concept of "Developing our town with our own hands".

THE FOURTH PILLAR: PROMOTION OF LOW-CARBON CITY NETWORK (CREATION OF SYNERGY)

As a city globally-renowned for its efforts to promote peace, we should take initiatives to solve global warming, a common issue for all humanity.

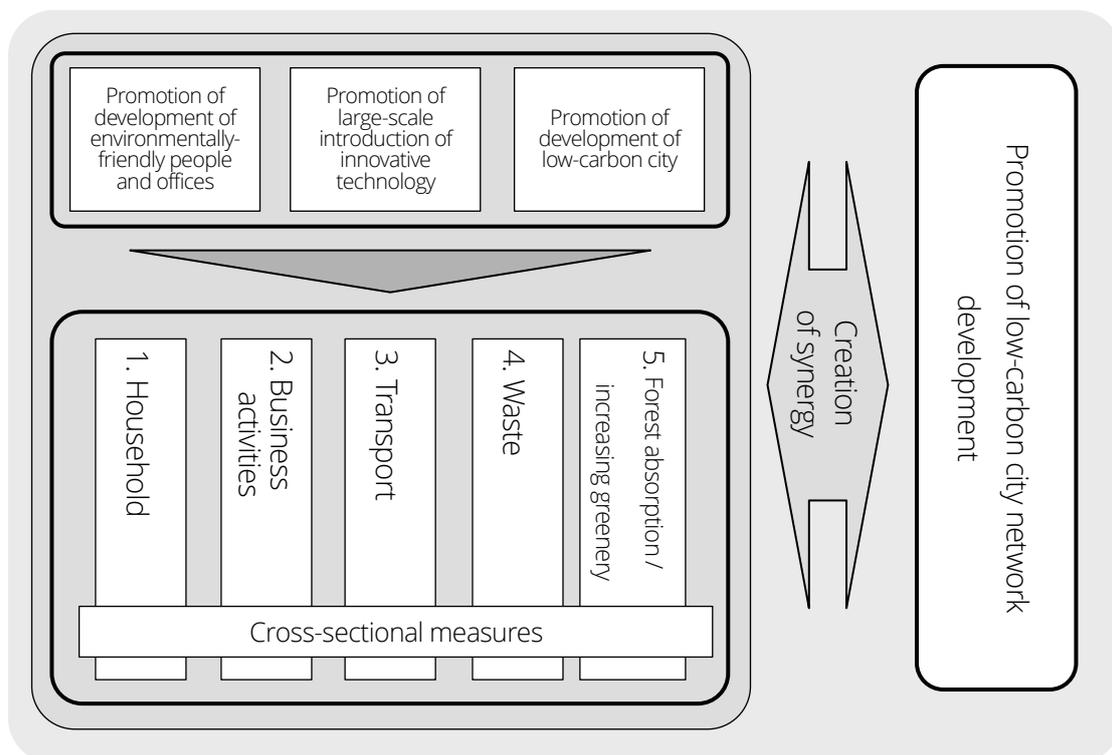
The fourth pillar is, therefore, the “Promotion of a low-carbon city network” that will solve global warming issues from a global viewpoint as a leading city in the Chugoku and Shikoku regions as well as the President City of Mayors for Peace whose members include more than 7,000 domestic and international cities.

4. Frameworks of measures

For global warming countermeasures, it is important that all agents including citizens, business operators and administrators, etc., take initiatives and act in all scenes of daily life and social economic activities.

As shown in the diagram below, scenes of daily life and social economic activities are divided into 5 scenarios. Measures for each scenario and cross-sectional measures will be promoted under the first, second and third pillars from the four directions of the measures described above.

Furthermore, the fourth pillar will be promoted to globally develop a low-carbon city, sharing our city's achievements and leading measures by other cities, creating synergies by developing a cooperative system with domestic and international cities.



5. Concrete measures for achieving the reduction target

Considering the frameworks of measures, measures for each scene of daily life and social economic activities will be promoted as follows. The achievement status of the greenhouse effect gas reduction target by implementing these measures will be managed by setting the KPI (Key Performance Indicator)*.

*KPI (Key Performance Indicator) is an index to evaluate the progress status of each measure. It is basically set as the index for the outcome of the measures concerned.

◆ Household

1) Promotion of development of environmentally-friendly people and offices (Change of Values)

Take measures to promote energy saving actions and environment-related learning/education by global warming prevention campaign, etc.

2) Promotion of large-scale introduction of innovative technology (Change of Action)

Take measures to promote the introduction of low-carbon houses with high energy-saving effect using innovative technology such as Net Zero Energy House (hereinafter called "ZEH") and Net Zero Energy Building (hereinafter called "ZEB"), and energy saving devices based on the state's Top Runner Program.

3) Promotion of development of low-carbon city (Change of Social System)

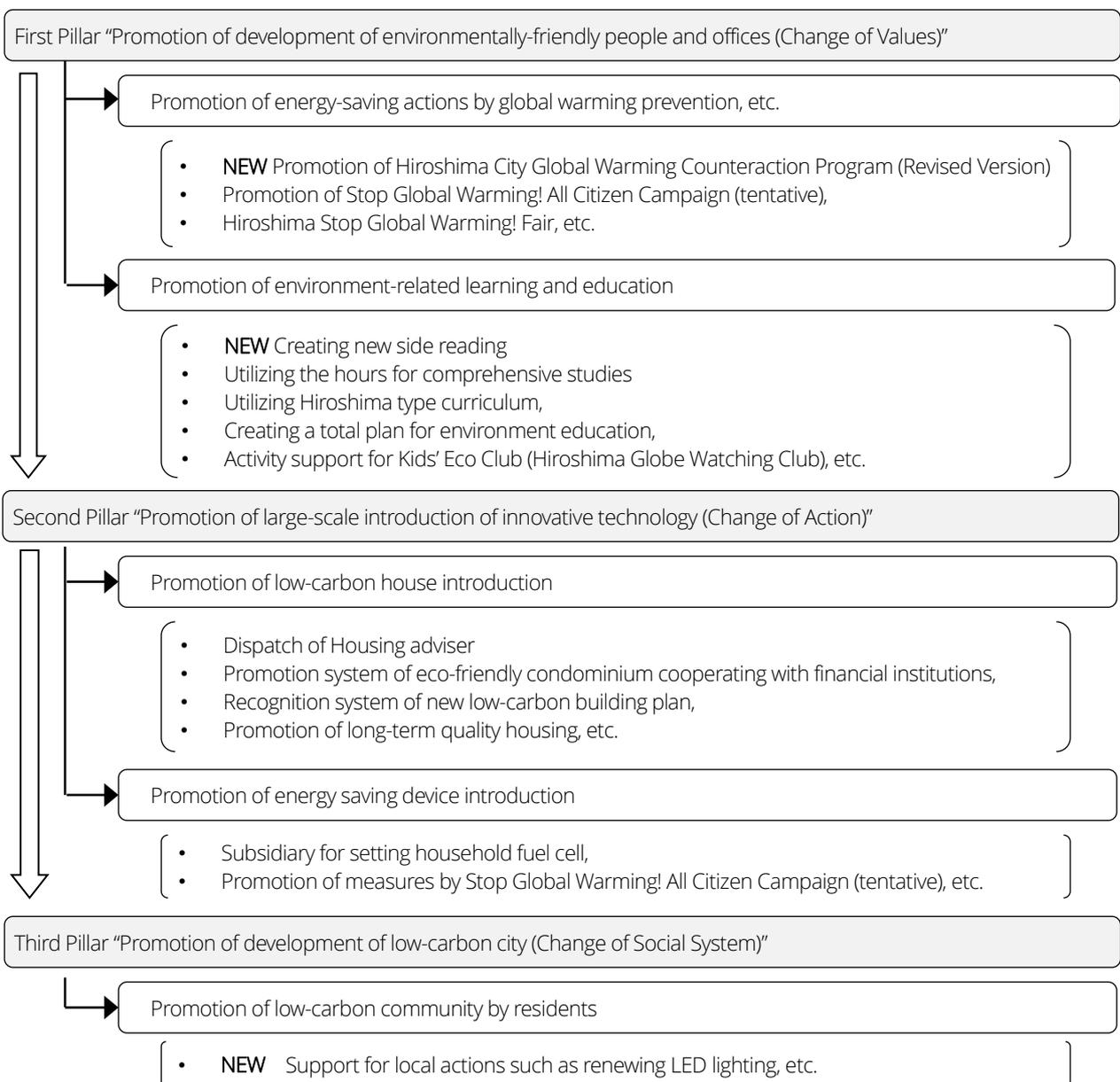
Promote the shift to an environmentally-friendly lifestyle developing low-carbon communities, etc. with residents' initiative, under the concept of "Develop our town by ourselves".

◇ Key Performance Indicator (KPI)

Name of Index		Current Status	Short-term(FY2020)	Mid-term (FY2030)
Newly-built house	ZEH	4.3% (FY2015)	50%	Almost 100%
	Low-carbon house	1.3% (FY2015)	50%	—
Newly-built apartment buildings	ZEB	—	—	Almost 100%
	Low-carbon house	0% (FY2015)	50%	—
Number of introduced household fuel cells (Total)		822 (FY2015)	15,000	56,000
Rate of citizens who have introduced LED lighting for more than 80% of household lighting		12.5% (FY2016)	50%	Almost 100%

(N.B.) ZEB is set along the state's "ZEB Roadmap" and to realize "Almost 100%" in FY2030; by that time, the values are set as "—". Further, ZEH and ZEB are set as "Almost 100%" in FY2030, and therefore, the values for low-carbon house are set as "—".

◇ Organization of measures



◇ Estimated amount of reduction

Segmentation for calculation	Estimated business amount		Estimated reduction amount (ton-CO2)	
	Short-term	Mid-term	Short-term	Mid-term
Promotion of development of environmentally-friendly people and offices (Change of Values)			57,000	90,000
Promotion of energy-saving actions by global warming prevention, etc.			57,000	90,000
Promotion of energy saving by the city's unique measures (Rate of households saving energy)	60%	90%	43,000	66,000
Promotion of the people's movement for energy saving (Rate of conducting Cool Biz, Warm Biz, etc.)	Cool Biz 86.5% Warm Biz 88.9%, etc.	Cool Biz 100% Warm Biz 100%, etc.	14,000	2,400
Promotion of large-scale introduction of innovative technology (Change of Action)			223,000	965,000
Promotion of introduction of low-carbon house			102,000	626,000
Introduction of newly-built ZEH, etc. (out of all new buildings)	25%	100%	22,000	222,000
Introduction of already-built ZEH, etc. (out of all buildings)	3.5%	30%	59,000	404,000
Introduction of new low-carbon house	50%	—	21,000	—

Segmentation for calculation	Estimated business amount		Estimated reduction amount (ton-CO2)	
	Short-term	Mid-term	Short-term	Mid-term
Promotion of introduction of energy saving devices, etc.			121,000	339,000
Introduction of household fuel cells	<u>15,000</u>	<u>56,000</u>	19,000	73,000
Introduction of batteries	32,000	160,000	12,000	135,000
Introduction of Top Runner devices (Improvement rate of energy consumption efficiency of refrigerator, air conditioner, etc.)	<u>refrigerator 12.2%</u> <u>air conditioner 11.1%, etc.</u>	<u>refrigerator 19.6%</u> <u>air conditioner 17.9%, etc.</u>	35,000	60,000
Introduction of LED lightening (out of all buildings)	80%	100%	55,000	71,000
Total			280,000	1,055,000

(N.B.) Among the above values of the estimated business amount, the underlined values show the amount that is arranged and calculated for our city area, based on the estimated business amount set as the calculation base for the greenhouse effect gas reduction amount in “the state global warming countermeasures”.

◆ Business activities

1) Promotion of development of environmentally-friendly people and offices (Change of Values)

Take measures to promote energy management and energy saving actions, as well as thorough management of devices using chlorofluorocarbons that have an extremely high greenhouse effect.

2) Promotion of large-scale introduction of innovative technology (Change of Action)

Take measures to promote the introduction of low-carbon houses with high energy-saving effect using innovative technology such as ZEB, and energy saving devices based on the state’s Top Runner Program.

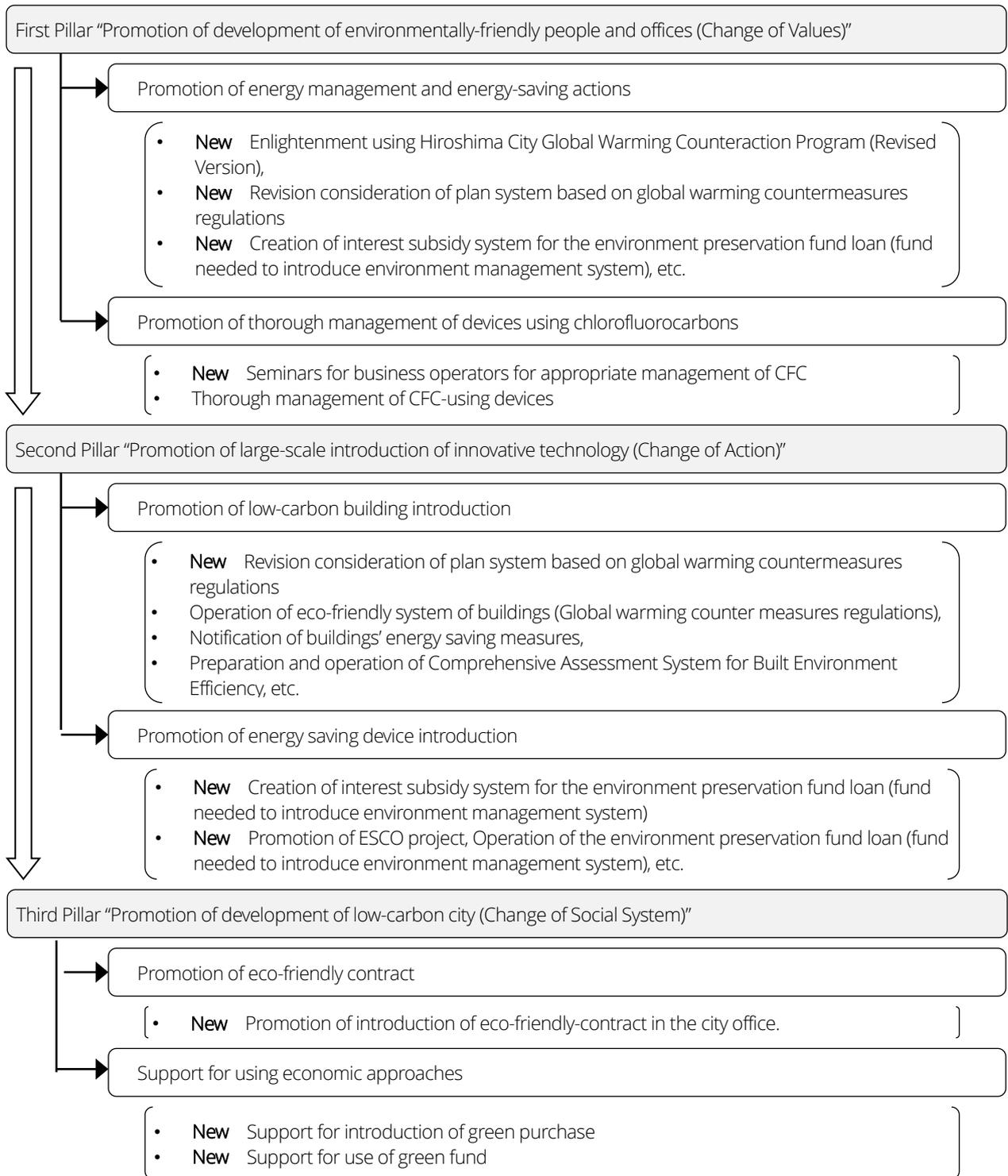
3) Promotion of development of low-carbon city (Change of Social System)

Promote the shift to the environmentally-friendly business style by promoting the reduction of carbon dioxide in product/services, and by improving carbon dioxide emission factors of electric utilities through the promotion of eco-friendly contracts and economic approaches such as green purchase/green fund, etc.

◇ Key Performance Indicator (KPI)

Name of Index	Current Status	Short-term (FY2020)	Mid-term (FY2030)
No. of introductions of Eco Action 21 and ISO14001 (total)	370 (FY2015)	500	1,000
Rate of offices that use LED lights for lighting	52.5% (FY2016)	88.1%	Almost 100%
Rate of offices that introduce Business Energy Management System (BEMS)	2.8% (FY2016)	13%	47%

◇ Organization of measures



◇ Estimated amount of reduction

Segmentation for calculation	Estimated business amount		Estimated reduction amount (ton-CO2)	
	Short-term	Mid-term	Short-term	Mid-term
Promotion of development of environmentally-friendly people and offices (Change of Values)			245,000	596,000
Promotion of energy management and energy-saving actions			182,000	404,000
Promotion of energy saving by the city's unique measures (Reduction effect by eco business activity system (global warming regulation) and Hiroshima city global warming counteraction program)	▲5%	▲10%	139,000	306,000
Promotion of BEMS (Rate of introduction by offices)	24%	47%	43,000	98,000
Promotion of thorough management of devices using chlorofluorocarbons			63,000	192,000
Prevention of CFC leak (decreased rate of leakage using more than 7.5kW devices and less than 7.5kW devices (separately set SC))	<u>More than 7.5kW</u> 27%	<u>More than 7.5kW</u> 83%	63,000	192,000
	<u>Less than 7.5kW</u> 16%, etc.	<u>Less than 7.5kW</u> 50%, etc.		
Promotion of large-scale introduction of innovative technology (Change of Action)			320,000	1,225,000
Promotion of low-carbon building introduction			—	657,000
Introduction of newly-built ZEB	0%	35%	—	20,000
Introduction of already-built ZEB	0%	25%	—	637,000
Promotion of energy saving device introduction			320,000	568,000
Introduction of Top Runner devices (Improvement rate of energy consumption efficiency of copiers, printers, etc.)	<u>copiers</u> 12.3%	<u>copiers</u> 37.3%	55,000	163,000
	<u>printers</u> 11.7% etc.	<u>printers</u> 35.3% etc.		
Introduction of cogeneration system	24.9MW	29.0MW	9,000	21,000
Introduction of renewable energy	67,000kW	107,000kW	31,000	62,000
Introduction of highly energy-efficient devices (hot water dispenser for professional use, etc.) (No. of introduced HP hot water dispenser, highly-efficient lighting, etc.)	<u>HP hot water dispenser</u> 490	<u>HP hot water dispenser</u> 1,360	83,000	112,000
	<u>highly-efficient lighting</u> 1.8 million, etc.	<u>highly-efficient lighting</u> 3.1 million, etc.		
Introduction of high energy saving facilities (industrial HP, etc.) (No. of introduced industrial motors, high efficient boiler, etc.)	<u>industrial motors</u> 86,000	<u>industrial motors</u> 204,000	142,000	210,000
	<u>highly efficient boiler</u> 440, etc.	<u>highly efficient boiler</u> 630, etc.		
Total			565,000	1,821,000

(N.B.) Among the above values of the estimated business amount, the underlined values show the amount that is arranged and calculated for our city area, based on the estimated business amount set as the calculation base for the greenhouse effect gas reduction amount in the “the state global warming countermeasures”.

◆ Transport

1) Promotion of development of environmentally-friendly people and offices (Change of Values)

Promote the eco-driving and use of public transport, etc., as well as local food production for local consumption for food miles reduction, etc.

2) Promotion of large-scale introduction of innovative technology (Change of Action)

Promote introduction of next generation vehicles such as electric vehicles and clean diesel cars.

3) Promotion of development of low-carbon city (Change of Social System)

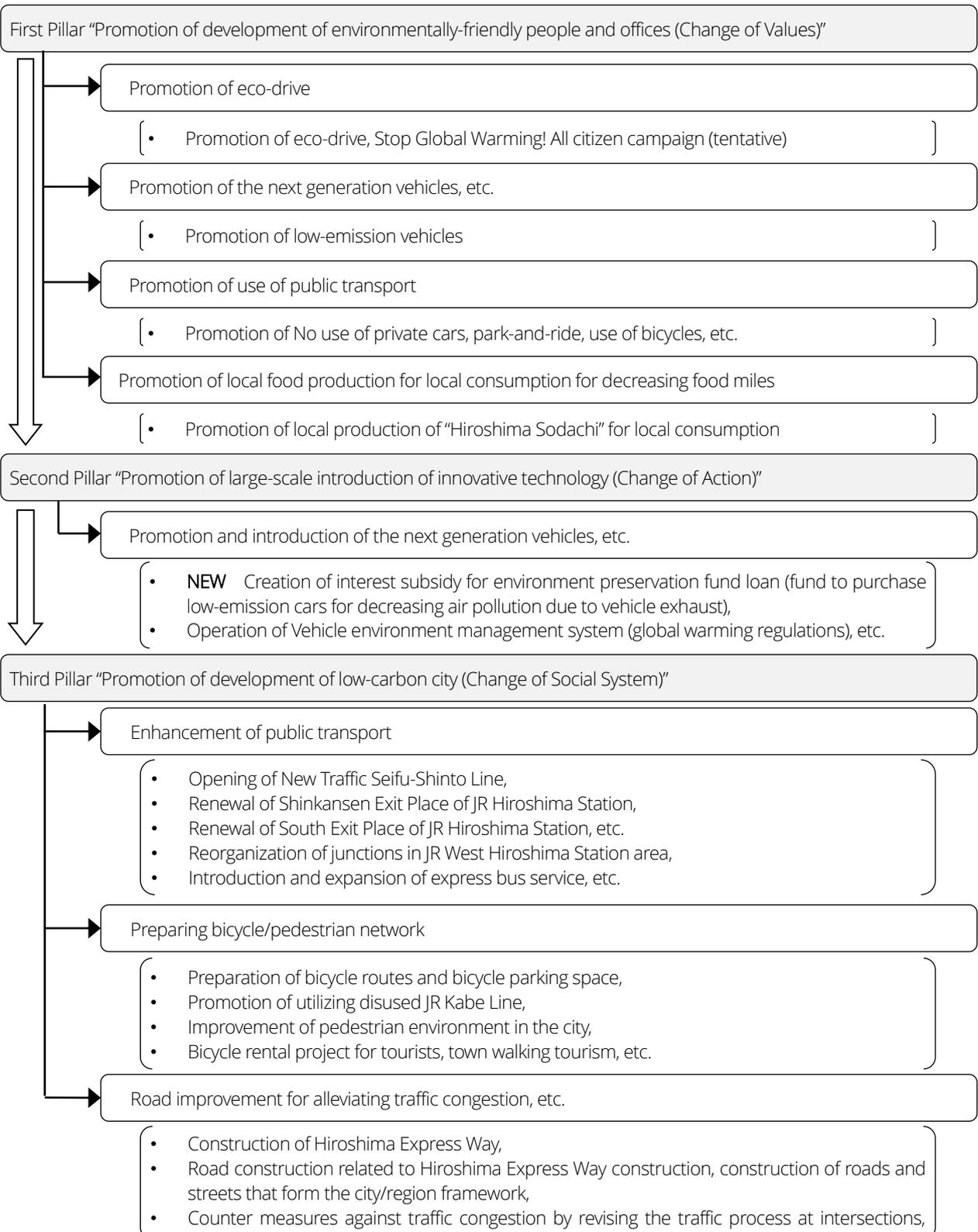
Make transport smart and low-carbon by enhancing public transport as well as by preparing the bicycle/pedestrian network as well as promoting road improvement for alleviating traffic congestion, etc.

◇ Key Performance Indicator (KPI)

Name of Index	Current Status	Short-term (FY2020)	Mid-term (FY2030)
Rate of No. of owned next generation vehicles	14.2% (FY2015)	19%	38%
No. of public transport users in the city	567,000people /day (FY2014)	598,000people /day	—

(N.B.) "No. of public transport users in the city" shows the values set in the "Hiroshima local public transport network creation plan"; however, the target is not set for FY2030, and therefore, it is shown as "—".

◇ Organization of measures



◇ Estimated amount of reduction

Segmentation for calculation	Estimated business amount		Estimated reduction amount (ton-CO2)	
	Short-term	Mid-term	Short-term	Mid-term
Promotion of development of environmentally-friendly people and offices (Change of Values)			18,000	24,000
Promotion of eco-drive			18,000	24,000
Improvement of eco-drive rate (Rate by cars and trucks)	<u>Cars 20%</u> <u>Trucks 30%, etc.</u>	<u>Cars 25%</u> <u>Trucks 35%, etc.</u>	18,000	24,000
Promotion of large-scale introduction of innovative technology (Change of Action)			112,000	520,000
Promotion and introduction of the next generation vehicles, etc.			112,000	520,000
Improvement of fuel economy of vehicles	<u>18.5km/ℓ</u>	<u>24.8km/ℓ</u>	112,000	520,000
Total			130,000	544,000

(N.B.) Among the above values of the estimated business amount, the underlined values show the amount that is arranged and calculated for our city area, based on the estimated business amount set as the calculation base for the greenhouse effect gas reduction amount in the “the state global warming countermeasures”.

◆ Waste

1) Promotion of development of environmentally-friendly people and offices (Change of Values)

Promote educational activities to make citizens and business operators take initiatives in waste reduction and recycling.

2) Promotion of large-scale introduction of innovative technology (Change of Action)

Increase the efficiency of waste power generation and the recycling rate of construction by-product produced at construction sites.

3) Promotion of development of low-carbon city (Change of Social System)

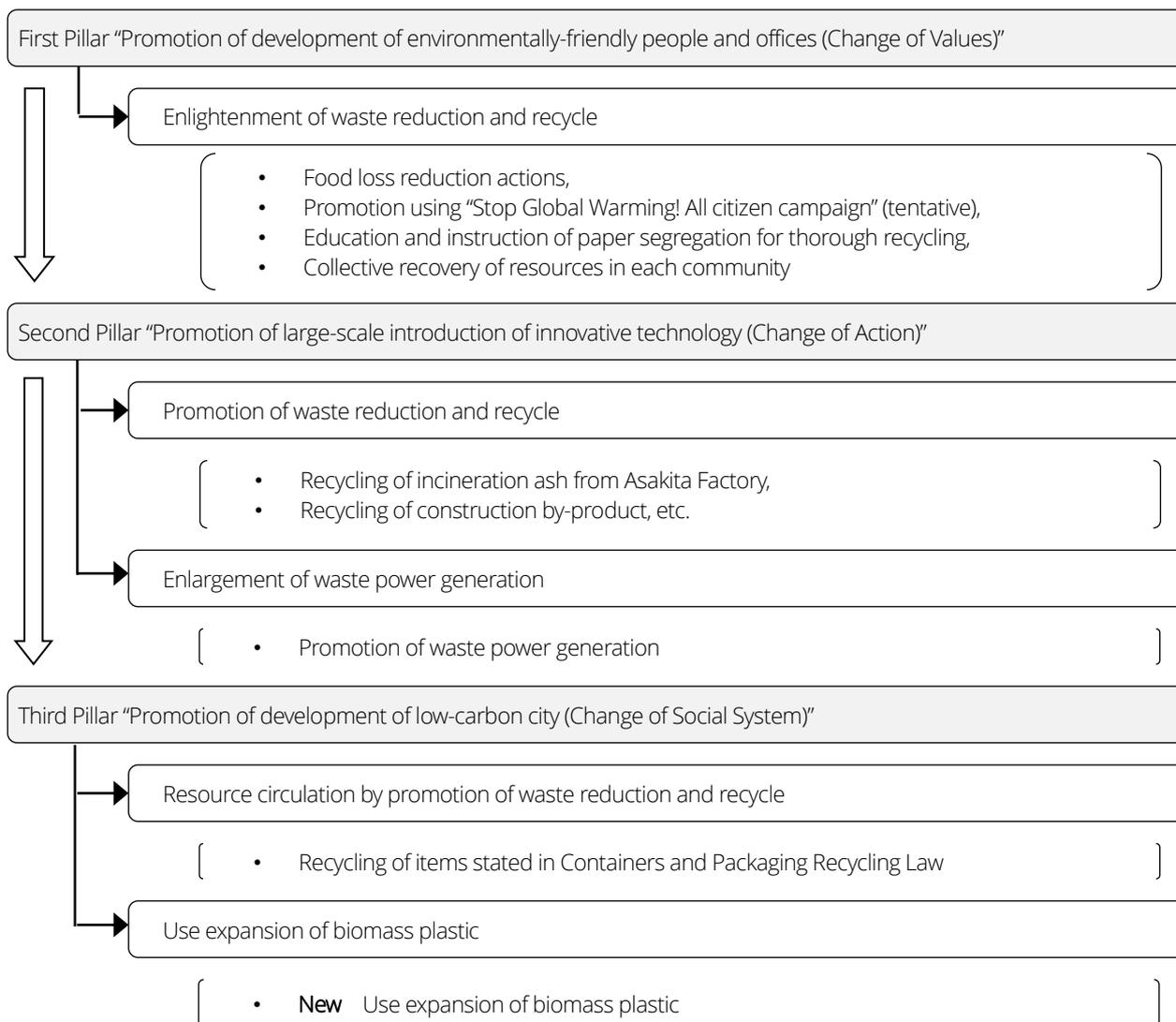
Construct the circulating system of resources and for a sustainable circulating society by promoting the shift from using petroleum-derived plastic that emits a large amount of greenhouse effect gases at burning to using biomass plastic whose raw materials are carbon-free plants, etc.

◇ Key Performance Indicator (KPI)

Name of Index	Current Status	Short-term (FY2020)	Mid-term (FY2030)
Waste amount per day per person	859 g/person/day (FY2013)	826 g/person/day	—
Incineration amount of waste	304,000 ton/year (FY2013)	295,000 ton/year	—

(N.B.) Short-term target of “waste amount per day per person” is the target value of FY2019 set in the “Hiroshima City General Waste Process Basic Plan”. “Waste amount per day per person” and “incineration amount of waste” show the target values set in the “Hiroshima City General Waste Process Basic Plan”, but the target value is not set for FY2030, and therefore, it is shown as “—” here.

◇ Organization of measures



◇ Estimated amount of reduction

Segmentation for calculation	Estimated business amount		Estimated reduction amount (ton-CO2)	
	Short-term	Mid-term	Short-term	Mid-term
Promotion of development of environmentally-friendly people and offices (Change of Values)			6,000	9,000
Enlightenment of waste reduction and recycle			6,000	9,000
Waste reduction (incineration amount of waste)	295,000 tons	285,000 tons	6,000	9,000
Promotion of development of low-carbon city (Change of Social System)			1,000	17,000
Use expansion of biomass plastic			1,000	17,000
Use expansion of biomass plastic (Shipment of biomass plastic)	<u>7,700 tons</u>	<u>19,200 tons</u>	1,000	17,000
Total			7,000	26,000

(NB 1) "Waste reduction" of mid-term estimated business amount is the target value of FY2024 stated in the Hiroshima City General Waste Basic Plan.

(NB 2) Among the above values of the estimated business amount, the underlined values show the amount that is arranged and calculated for our city area, based on the estimated business amount set as the calculation base for the greenhouse effect gas reduction amount in the "the state global warming countermeasures".

◆ **Source of forest absorption /planting trees**

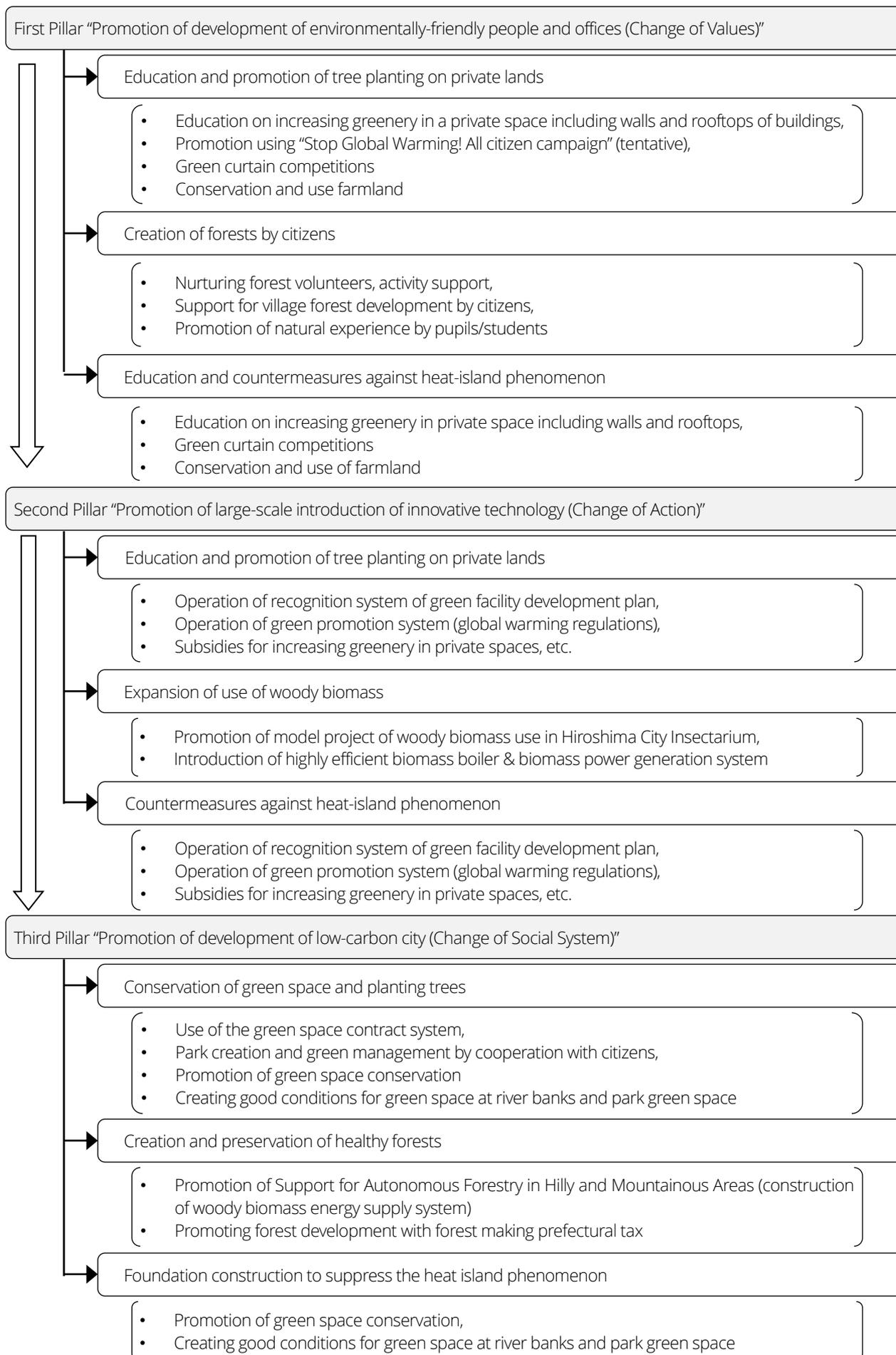
- 1) Promotion of development of environmentally-friendly people and offices (Change of Values)
Education and promotion of tree planting on private lands and creation of forests by citizens
- 2) Promotion of large-scale introduction of innovative technology (Change of Action)
Promotion of tree planting on private lands as well as the introduction of woody biomass
- 3) Promotion of development of low-carbon city (Change of Social System)
Conservation and tree planting on green lands, creating and preserving healthy forests
- 4) Countermeasures against heat-island phenomenon
Promote to increase greenery on the top and sides of buildings in the city, utilizing the network of rich water and greenery from our forests, green land, rivers, coasts, etc., which are the city's characteristics, under the three pillars of measure directions.

◇ Key Performance Indicator (KPI)

Name of Index	Current Status	Short-term (FY2020)	Mid-term (FY2030)
No. of introduced biomass boilers in the city facilities (cumulative total)	1 (FY2016)	3	9
Area of park and green spaces	975.71ha (FY2015)	1,000ha	—

(N.B.) "Area of park and green spaces" is the target value set in "Hiroshima City Basic Green Plan", however, as it is not set for FY2030, it is shown as "—".

◇ Organization of measures



◇ Estimated amount of reduction

Segmentation for calculation	Estimated business amount		Estimated reduction amount (ton-CO2)	
	Short-term	Mid-term	Short-term	Mid-term
Promotion of large-scale introduction of innovative technology (Change of Action)			1,000	2,000
Usage expansion of woody biomass			1,000	2,000
Introduction of biomass boilers in city facilities	3	9	1,000	2,000
Total			1,000	2,000

◆ **Cross-sectional measures**

1) Promotion of development of environmentally-friendly people and offices (Change of Values)

In response to the statewide movement “COOL CHOICE”, citizens, business operators and administrations, etc., cooperate under the same target; conduct “Breaking Free from Global Warming! All citizens Campaign (tentative)” that aims to reduce greenhouse gas emissions by saving energy, etc., foster the values, and act in an environmentally-friendly way.

Further, educate people and promote the meaning and necessity of, not only global warming countermeasures, but also the smart community that is a beneficial system for regional development as well as economic development.

2) Promotion of large-scale introduction of innovative technology (Change of Action)

Promote and expand the use of the dispersed power system whose energy can be effectively used in a community as well as an emergency power source at the time of disaster, and build the foundation of a smart community.

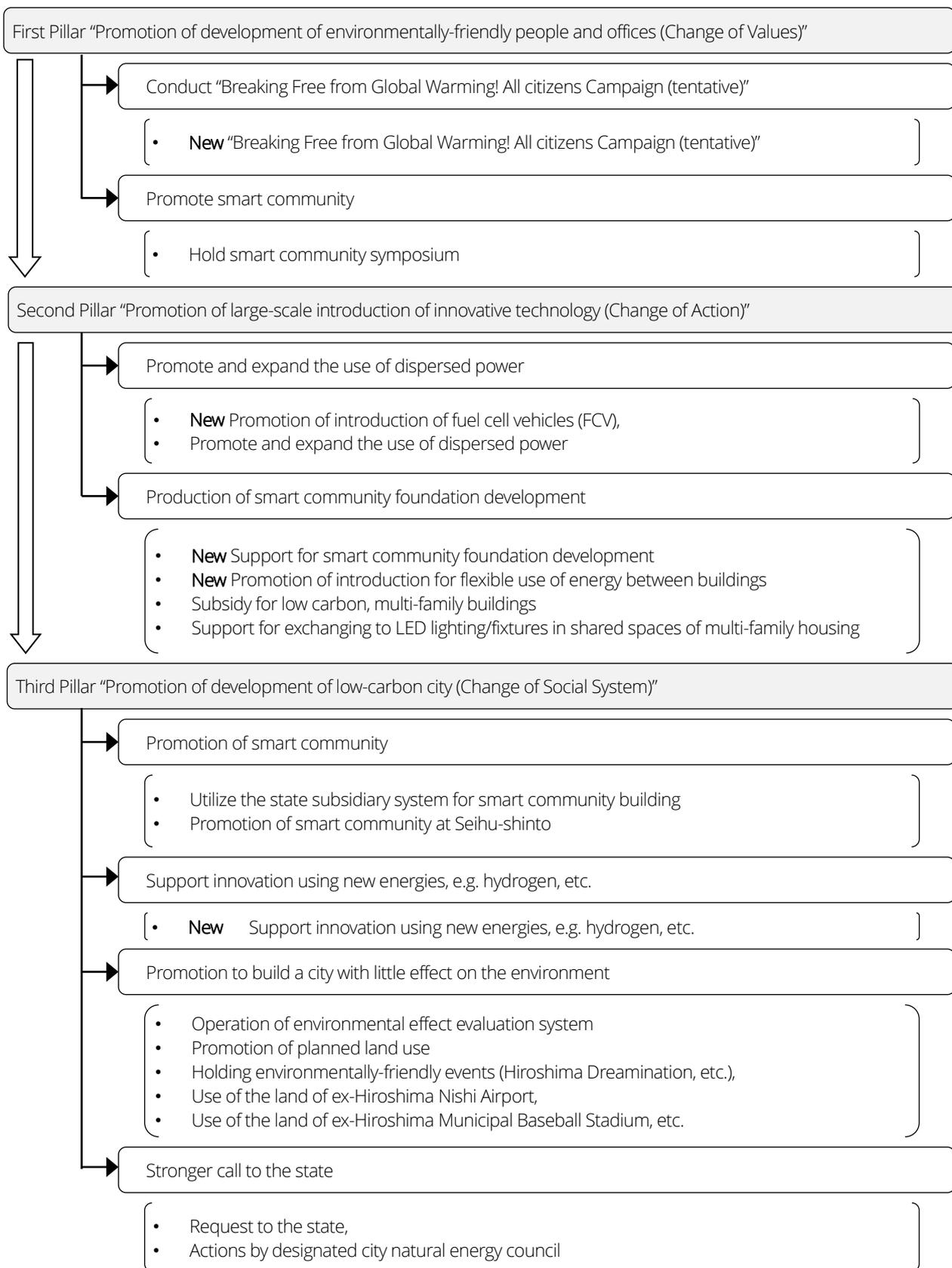
3) Promotion of development of low-carbon city (Change of Social System)

Promote the construction of a sustainable low-carbon city by promoting smart community, supporting innovation with new energies, e.g., hydrogen, etc., and promoting the building of a city with little effect on the environment.

◇ Key Performance Indicator (KPI)

Name of Index	Current Status	Short-term (FY2020)	Mid-term (FY2030)
Introduction no. of dispersed power in the city facilities (cumulative total)	0 (FY2016)	1	8
Introduction no. of smart communities (cumulative total)	1 (FY2016)	3	10

◇ Organization of measures



◆ **Promotion of low-carbon city network**

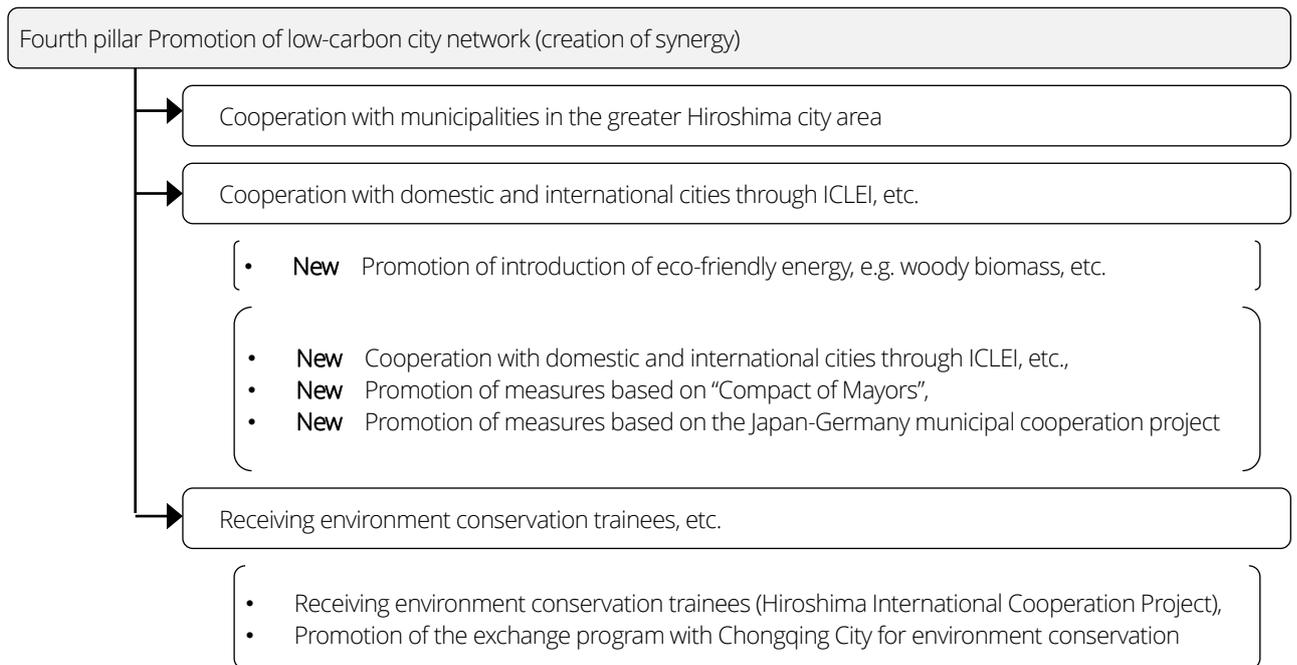
1) Measures in greater Hiroshima city area

We will share Hiroshima City's achievements with neighboring towns and consider a system to promote the introduction of eco-friendly energy. For example, we utilize the resources in the greater Hiroshima city area effectively, considering not only the circulation of energy in the area, but also the circulation of "people, objects and money" so that it would have an effect on the whole city area cooperating with municipalities in the area, and plan measures to promote the introduction of the next generation energy such as woody biomass, small hydroelectric generation and hydrogen, etc.

2) Cooperation with domestic and international cities

Hiroshima City is an executive board member city of the Japan Bureau of "ICLEI", an international network in which more than 1,500 municipalities participate, as well as a member city of "Compact of Mayors" participated by more than 7,100 municipalities (as of January 2017); the city aims to achieve "Compact of Mayors" for the first time in Japan, share our achievements and leading measures by other cities, build the system to cooperate with domestic and international cities for creating synergy, and create a low-carbon city from a global viewpoint.

◇ Organization of measures



◆ **Expected reduction volume by measures**

The expected reduction volume for short-term and mid-term targets by conducting the above measures are as follows and can be achieved:

<Achievement status of short-term and mid-term targets by system of measures>

Short-term: (983,000 tons, ▲5% achieved compared to FY2013)

Mid-term: [3,448,000 tons ▲30% achieved compared to FY2013]

(Unit:10,000 tons -CO₂)

	Promotion of development of environmentally-friendly people and offices (32.6) [71.9]	Promotion of large-scale introduction of innovative technology (65.6) [271.2]	Promotion of development of low-carbon city (0.1) [1.7]	Promotion of low-carbon city network
Household (28.0) [105.5]	<ul style="list-style-type: none"> Promotion of energy saving actions by global warming prevention campaign, etc. (5.7) [9.0] Promotion of environmental learning and education 	<ul style="list-style-type: none"> Promotion of introduction of low-carbon houses (10.2) [62.6] Promotion of introduction of energy saving devices (12.1) [33.9] 	<ul style="list-style-type: none"> Promotion of creating low-carbon community by residents 	<ul style="list-style-type: none"> Cooperation with municipalities in the greater Hiroshima city area Cooperation with domestic and international cities through ICLEI, etc. Receiving environment conservation trainees, etc.
Business activities (56.5) [182.1]	<ul style="list-style-type: none"> Promotion of energy management and energy saving actions (18.2) [40.4] Promotion of thorough management of devices using CFC (6.3) [19.2] 	<ul style="list-style-type: none"> Promotion of introduction of low-carbon buildings (—) [65.7] Promotion of introduction of energy saving devices (32.0) [56.8] 	<ul style="list-style-type: none"> Promotion of eco-friendly contract Support of use of economic approach 	
Transport (13.0) [54.4]	<ul style="list-style-type: none"> Promotion of eco drive (1.8) [2.4] Promotion of the next generation vehicles Promotion of use of public transport Promotion of local food production for local consumption, for decreasing food miles 	<ul style="list-style-type: none"> Promotion of the next generation vehicles (11.2) [52.0] 	<ul style="list-style-type: none"> Enhancement of public transport Promotion of bicycle and pedestrian network preparation Promotion of road improvement for alleviating traffic congestion 	
Waste (0.7) [2.6]	<ul style="list-style-type: none"> Promotion of waste reduction and recycle (0.6) [0.9] 	<ul style="list-style-type: none"> Promotion of waste reduction and recycle Enhancement of waste power generation 	<ul style="list-style-type: none"> Resource circulation by promoting waste reduction and recycle Diffusion of biomass plastic (0.1) [1.7] 	
Forest absorption /planting trees (0.1) [0.2]	<ul style="list-style-type: none"> Education on green increase in private space Promotion of forest creation by citizens Education on heat island countermeasures 	<ul style="list-style-type: none"> Promotion of green increase in private space Expansion of use of woody biomass (0.1) [0.2] Promotion of heat island countermeasures 	<ul style="list-style-type: none"> Conservation of greenspace and increasing greenery Fostering and conservation of healthy forests Promotion of foundation building for heat island phenomenon suppression 	
Cross-sectional measures	<ul style="list-style-type: none"> Promotion of “Stop Global Warming! All citizens Campaign ” Education on smart community 	<ul style="list-style-type: none"> Diffusion of dispersed power Promotion of foundation building for smart community 	<ul style="list-style-type: none"> Promotion of smart community Support for innovation using new energies such as hydrogen, etc. Promotion of eco-friendly city creation Stronger call to the state 	



Creation of synergy

(N.B) () shows the estimated reduction of emissions for the short-term; [] shows that of the mid-term.

* The estimated reduction of emissions for long-term is not calculated due to the difficulty in estimating technical innovation and social economic changes, etc.

<Achievement status of short-term and mid-term targets by greenhouse effect gases>

(Unit:10,000 tons -CO2)

		FY2013 emissions	FY2020 [FY2030]				
			Estimated values	Estimated reduction	Emissions after reduction	Rate of reduction	Target
CO2	Industrial	160.1	179.9[188.7]	23.5 [39.8]	156.4[148.9]	▲2.3% [▲ 7.0%]	- [▲ 7%]
	Consumer/household	224.4	235.5 [241.1]	28.0 [105.5]	207.5 [135.6]	▲7.5% [▲39.6%]	- [▲ 40%]
	Consumer/business	272.6	279.2 [287.8]	26.8 [123.3]	252.4 [164.5]	▲7.4% [▲39.7%]	- [▲ 40%]
	Transport	163.0	167.8 [171.8]	13.0 [54.4]	154.8 [117.4]	▲5.0% [▲28.0%]	- [▲ 28%]
	Waste	17.2	18.8 [18.6]	0.7 [2.6]	18.1 [16.0]	+5.2% [▲ 6.7%]	- [▲ 6.7%]
Methane		2.9	2.6 [2.2]	0.0 [0.0]	2.6 [2.2]	▲10.3%[▲24.1%]	- [▲12.3%]
Dinitrogen monoxide		13.1	11.6 [9.7]	0.0 [0.0]	11.6 [9.7]	▲11.5%[▲26.0%]	- [▲ 6.1%]
4 gases (e.g. CFC alternatives)		26.3	38.9 [38.9]	6.3 [19.2]	32.6 [19.7]	+24.0%[▲25.1%]	- [▲25.1%]
Total		879.6	934.3 [958.8]	98.3 [344.8]	836.0 [614.0]	▲5.0% [▲30.2%]	▲5% [▲30%]

(N.B.) Figures in each column are rounded off; the values in the rate of reduction may not meet the rate by emission amount.

Chapter 6: Adapting to the effects of climate change (Adaptation)

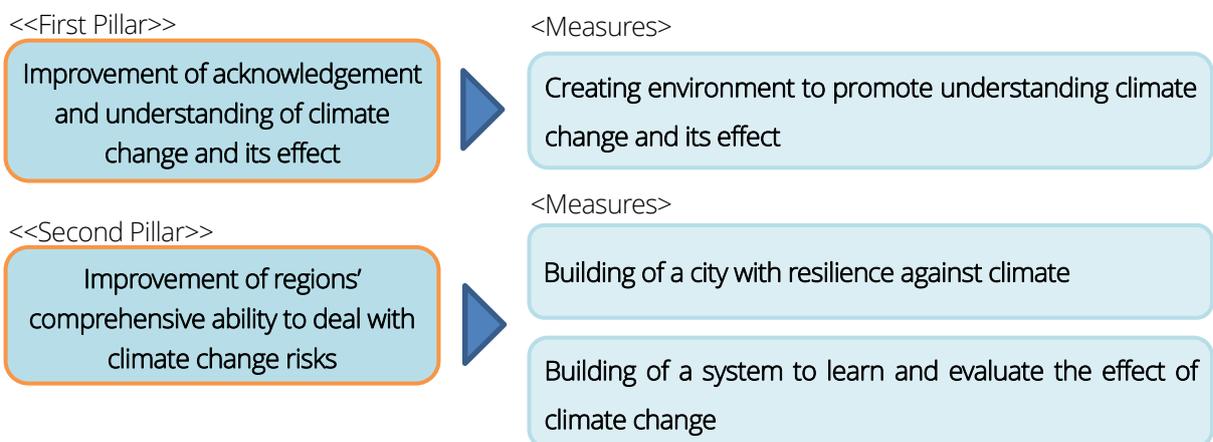
1. Significance and need for taking action

“Adaptation Measures” are to minimize or avoid the damages by the effect of climate change and aim to create a safe, secure and sustainable society that can recover swiftly.

The effect of climate change due to global warming is becoming obvious even in the city, e.g., the heavy rain and landslide disaster in Hiroshima in August 2014. Effective and comprehensive promotion of the “Adaptation Measures” is required for the city’s current status and characteristics based on regional measures defined in the “Adaptation countermeasures against the effect of climate change” decided by the cabinet in November 2015.

2. Direction and structure of measures

Adaptation measures will have 2 pillars as the directions of measures; under those pillars, there are 3 measures that will be comprehensively developed in line with the plan.



3. Concrete measures

1) Creating an environment to promote understanding of climate change and its effect

Promote the creation of an environment for more accurate understanding of climate change and its effect.

◇ Main measures

- New Publicity and education using the city's PR magazine "Hiroshima Citizens and Municipal Government" and the city website,
- New Preparation of sub-readings available for school education,
- New Delivery lecture by the city and Hiroshima City Global Warming Countermeasure Regional Council, etc.

2) Building resilience against climate change

The city will advance measures in 7 areas in which "the state's adaptation plan" will be adopted according to natural/economic/social conditions; particularly, the city will focus on the items of "natural disaster/coast area", "health" and "people's life/city life" whose damage by climate change has become obvious in the city.

There are many measures that have already been implemented from the viewpoints of disaster prevention and healthcare; however, they will be advanced with the additional "adaptation" viewpoint.

We choose the effective measures for adaptation from the "City creation of prevention of disaster / decrease disaster" in the comprehensive creation strategy "Hiroshima, the "city" we can be proud of in the world" prepared in FY2015; based on these measures, the city will conduct the steady promotion.

◇ Main measures

【Measures against increase of heavy rain in short time】

- City renovation for disaster prevention, construction of disaster information sharing system, enhancement of disaster information delivery system

【Measures against the effect of climate change on health due to the temperature rises, etc.】

- Publicity on heat disorder, information provision of heat disorder prevention

【Countermeasures against heat (heat island phenomenon, etc.)】

- Creation of water and green network by the conservation and creation of public open space such as rivers and roads through which the wind passes; promotion of greenery increase on roof and walls of buildings (including those by the green promotion system).

7 adaptation areas the state defines

- | | |
|---|-----------------------------------|
| 1. Agriculture, forest/forestry, fishing industry | 5. Health |
| 2. Water environment/water resource | 6. Industry / economic activities |
| 3. Natural ecosystem | 7. People's life/city life |
| 4. Natural disaster/coast area | |

3) Building of a system to learn and evaluate the effects of climate change

In order to prepare for the estimated effects and advance "adaptation measures" appropriately at a suitable time, the city will cooperate with the state and universities and consider a system to learn and evaluate.

Chapter 7: Government operations

* This chapter is restructured as the “Local Government Action Plan: Government Operations” based on Article 21 of the Act on Promotion of Global Warming Countermeasures.

Promotion of counteractions against global warming (mitigation measures)

1. Purpose

Acknowledging the fact that the city itself is one of the operators with a great amount of greenhouse gas emissions, in order to achieve the city's reduction target set in Chapter 5 in this plan “Promotion of Counteractions against Global Warming (mitigation measures)”, the city takes initiatives and reduces greenhouse gas emissions, as well as promoting the voluntary actions of citizens and business operators by the city measures.

2. Existing measures and issues

In the old plan, the target was “8.5% reduction of greenhouse gas emissions compared to FY2004” and we conducted daily energy saving, expansion of waste power generation, 100% recycle of sewage sludge and the introduction of solar power generation facilities, etc.; however, due to increasing waste incineration and postponement of old facility renewal due to economic reasons, etc., the target was not achieved.

The city should take further actions for promoting the reduction of waste and recycling to citizens and business operators, promoting energy saving actions, renewal of more energy-efficient facilities and introduction of solar power generation systems, etc.

3. Reduction target

Segment	Base Year	Target Year	Reduction target	
			City area	City office
Short-term target	FY2013	FY2020	▲5%	▲5.1%
	Target by emission type	<i>Emissions from offices concerning municipal administration</i>		▲9.1%
		<i>Emissions from waste processing</i>		▲1.1%
		<i>Emissions from sewage processing</i>		▲4.1%
<i>Emissions from water supply</i>		▲2.4%		
Mid-term target	FY2013	FY2030	▲30%	▲30%

4. Policy direction

- In order to reduce greenhouse gas emissions, each staff member will continuously take actions. The city will also change the “system” of administration as follows for achieving targets effectively and efficiently in the limited budget.

3 systems

1. Introduction of contract system based on the eco-friendly contract laws(*)
2. “Promotion of procuring of environmental goods based on “Hiroshima City Green Purchase Policy”
3. Thorough application of “Energy saving specification of city-owned buildings”

* Contract system based on the eco-friendly contract laws, also called the Green Contract, is a contract system that evaluates the environmental functions on top of prices, while maintaining certain competitive prices, and chooses contract partners from those who have the products and services with the best environmental functions.

- In order to promote the use of eco-friendly energy, surplus power from waste power generation, etc., after self-consumption is counted as the reduction of greenhouse gas emissions.
- For the emission of greenhouse effect gases from processing waste, sewage and water supply, the planned introduction of the facilities with a high-energy saving effect and efficient use of resource/energy are conducted.

5. Main measures by emission source and estimated reduction of greenhouse gas emissions

(unit: ton-CO₂)

Main measures by emission source		Estimated reduction
Emissions from offices concerning municipal administration		18,700
	Promotion by each staff member	1,350
	Power contract based on eco-friendly contract laws	8,770
	Introduction of LED lighting (Basically 50% of straight tube type fluorescents with more than 15 years of use are to be changed)	5,970
	Carbon management promotion project (facility renewal and operation improvement)	1,050
	Facility renewal by ESCO project	380
	Introduction of the next generation vehicles (renewal of basically more than 50% of public cars except special-purpose vehicles)	410
	Thorough conduct of eco-drive	240
	Introduction of solar power and woody biomass, etc.	530
Emissions from waste processing		17,200
	Waste reduction and recycle, efficiency improvement of waste power generation	17,200
Emissions from sewage processing		7,330
	Efficiency improvement of facilities, expansion of sewage gas power generation	7,330
Emissions from water supply		180
	Efficiency improvement of facilities (lighting, voltage transformation facility, etc.)	180

○ Adapting to the effects of climate change (adaptation)

1. Purpose

Adaptation measures by the city promote the measures by all the city organizations as well as promoting voluntary actions by citizens and business operators in order to firmly advance the measures stated in Chapter 6 "Adaptation to the effect of climate change due to global warming (Adaptation Measures)."

2. Policy direction

- Promote publicity and education of city staff by training, etc.
- Infrastructures and lifelines such as roads and water/sewage systems are prepared under the city's responsibility to minimize or avoid the effect by estimated disaster to civil life and business activities. Even at the time of disaster, the city takes appropriate measures at right timings for swift recovery.
- Public facilities are operated from the additional viewpoint of adaptation.
- The city will promote the voluntary actions of citizens and business operators by taking its own initiatives.

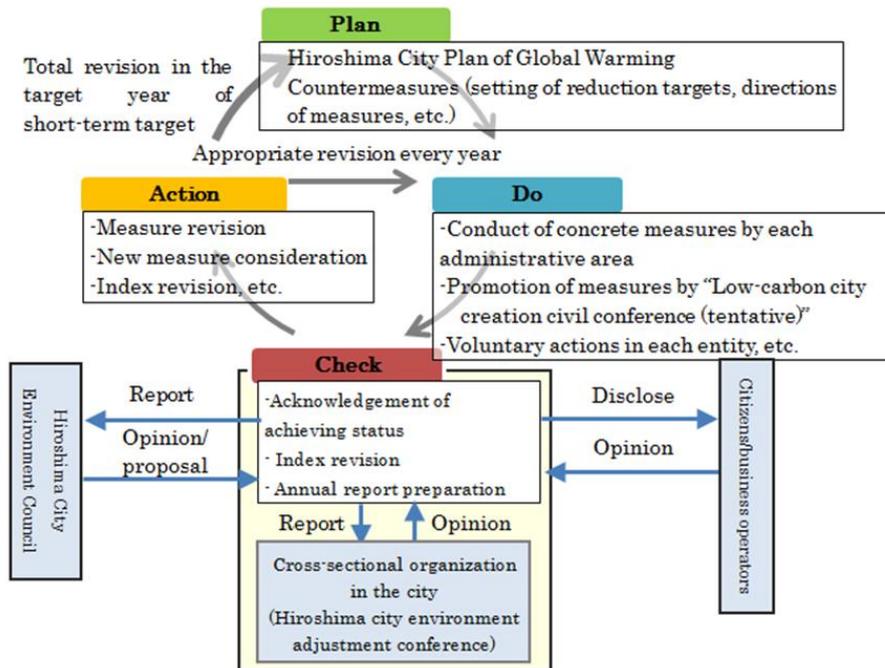
○ Progress management, etc.

- In order to progress the city measures, progress is managed based on the "Hiroshima City Environment Management System" that has been uniquely developed by the city.
- The conduct status of each year will be published on the city website.

Chapter 8: Plan Promotion

1. Plan promotion system and progress management

- For advancing this plan, each agent including citizens, business operators and administrators (the city) becomes conscious of its role, cooperates with others and takes actions together.
- By preparing this plan, “Low-carbon City Development Citizens Conference (tentative)” representing citizens, business operators and administrators, etc., is established as a system to take actions together.
- For appropriately advancing this plan, progression is managed every year using the PDCA cycle as below.



2. Revision of plan

In the short-term target year in this plan (FY2020), the achievement status of measures will be evaluated, and directions of measures and reduction target of greenhouse effect gases, etc. will be revised based on the domestic and international changes concerning global warming as well as social economic changes, and then the plan will be changed or the next plan will be prepared.