Ministry of the Environment

FY2023 City-toCity Collaboration Programme for Zero-Carbon Society

Project for accelerating GHG net zero emission under the Bangkok Master Plan on Climate Change

Report

March 2024

Overseas Environmental Cooperation Center, Japan

City of Yokohama

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Abbreviations

ADB	Asian Development Bank
AEDP	Alternative Energy Development Plan
AIM	Asia Pacific Integrated Model
APEX	Advanced Practices for Environmental Excellence in Cities
BAU	Business As Usual
BMA	Bangkok Metropolitan Administration
C40	C40 Cities Climate Leadership Group
CCS (DOE/CCS)	Sub-division for Climate Change Strategies/Department of Environment
COP	Conference of the Parties
DOE	Department of Environment
DPW	Department of Public Works
EEDP	Energy Efficiency Development Plan
GHG	Greenhouse Gas
IFC	International Finance Corporation
JCM	Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
M&E	Monitoring and Evaluation
MRV	Measurement, Reporting and Verification
NAP	National Adaptation Plan
NDC	Nationally Determined Contributions
PCD	Pollution Control Department
PPP	Public-Private Partnership
SC	Steering Committee
SED	Strategy and Evaluation Department
TF	Task Force
TGO	Thailand Greenhouse Gas Management Organization
UNFCCC	The United Nations Framework Convention on Climate Change
WG	Working Group

I Background of the project

Since the late 2000s, the BMA has been planning and implementing climate change measures with support from the Japanese government. In 2009, the BMA developed the "BMA Action Plan on Global Warming Mitigation 2007-2012" with the support of the Japan International Cooperation Agency (JICA), followed by the JICA technical cooperation project "Project for Bangkok Master Plan on Climate Change 2013 - 2023" and its successor project “Project for Strengthening Institutional Capacity for the Implementation of Bangkok Master Plan on Climate Change 2013-2023", BMA has been working on the formulation and implementation of the Climate Change Master Plan. BMA has also promoted cooperation with the City of Yokohama to form mitigation projects, including the JCM Model Project, through the "City-to-City Collaboration Programme for Zero-Carbon Society " launched by the Ministry of Environment, Japan in 2013. In addition, the Thai government has recently set mitigation target for 2030 and long-term target for 2050 and beyond, and from the perspective of GHG emissions, Bangkok, the largest city in Thailand, is required to take more proactive climate change measures toward decarbonization.

In response to the efforts of the BMA, the City of Yokohama has been providing support for climate change measures through dispatching officials to BMA and accepting training visits to Japan since 2009 based on a memorandum of understanding with BMA on technical cooperation for sustainable urban development, and the two cities have built a longstanding relationship of trust. The City of Yokohama is actively pursuing climate change initiatives and has a "Zero Carbon Yokohama" goal of decarbonization by 2050, and Yokohama has many useful insights for the BMA to use in its decarbonization efforts. The BMA has strong expectations for learning from Yokohama's experience and expertise in climate change policy as well as for forming projects through collaboration between the private sectors of the two cities.

At the start of this project, the Director of the Yokohama International Bureau and the Board member of OECC paid a courtesy visit to the Department of Environment of BMA in December 2021 and held director-level discussions in a hybrid meeting and reached a basic agreement to cooperate in the implementation of this project. In addition, in July 2023, the Director of Yokohama International Bureau and the board member of OECC paid a courtesy visit to the Governor of BMA and confirmed and agreed on the renewal of the Intercity Agreement between the City of Yokohama and BMA. Furthermore, at the 12th Asia Smart City Conference (ASCC) held by the City of Yokohama in November 2023, the Mayor of City of Yokohama and the Governor of BMA announced the “Yokohama Declaration: Asian Cities Together Towards Zero Carbon” which was endorsed by 43 cities and institutions participating in the conference. The declaration expressed solidarity among Asian cities to co-create a sustainable and resilient zero-carbon future.

This project is built on the existing cooperative relationship between the two cities and further strengthened and utilized a public-private partnership platform involving the private sector to promote the implementation of the new Bangkok Climate Change Master Plan at both the policy and project levels.

Photo: Courtesy visit to the Governor of BMA in July 2023

Photo: Visit of the Governor of BMA to the City of Yokohama in November 2023

Photo: Visit of the Governor of BMA to Ministry of Environment, Japan in November 2023

II **Overview of the project**

1. Climate change policies of Thailand and Bangkok

(1) Climate change policies of Thailand

Thailand has incorporated climate change measures into its National Economic and Social Development Plan since 2007, and is implementing climate change measures based on its plans including Climate Change Master Plan and Electricity Development Plan. In addition, Thailand, as a party to the Paris Agreement, submitted its NDC in 2016 that set a mitigation target of a 20-25% reduction in GHG emissions compared to BAU by 2030. Furthermore, the second updated NDC submitted in November 2022 updated the mitigation target of 30% to 40% reduction in GHG emissions compared to BAU by 2030. In November 2021, Thailand set long-term goals of becoming carbon neutral by 2050 and achieving net-zero emissions by 2065. The table below provides a summary of the second updated NDC, primarily related to the mitigation component.

Table 1: Outline of second updated NDC (November 2022)

Mitigation target	Mitigation target: Thailand intends to reduce its greenhouse gas emissions by 30 percent from the projected business-as-usual (BAU) level by 2030. The level of contribution could increase up to 40 percent, subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support. (BAU emissions in 2030 is approximately 555 million tCO2e)
Sectors	Economy-wide (excluding land use, land-use change, and forestry)
GHGs	- Carbon dioxide (CO2) - Methane (CH4) - Nitrous oxide (N2O) - Hydrofluorocarbons (HFCs) - Perfluorocarbons (PFCs) - Sulphur hexafluoride (SF6)
Support needs on technology development and transfer	Development of energy efficiency and renewable energy technologies, including innovative and cost-effective technologies and advanced energy storage and demand-side management approaches
International market-based cooperation	Thailand welcomes discussion to explore international market-based cooperation in the context of Article 6 of the Paris Agreement, that promotes development and transfer of advanced technologies and innovation and provides access to financial resources that support Thailand's achievement of NDC and LT-LEDS.

Sectoral mitigation measures, targets, and responsible agencies based on the NDC for energy, transportation, industry, waste, agriculture, and other sectors will be renewed in sectoral action plans to be developed in the future.

Regarding cooperative approaches under Article 6.2 of the Paris Agreement, Thailand has concluded bilateral agreements with Japan and Switzerland to promote the transfer of mitigation outcomes and project development. In addition, Thailand has begun cooperation with Singapore in anticipation of a bilateral agreement on Article 6 cooperation. A summary of bilateral cooperations under Article 6.2 of the Paris Agreement is shown in the table below.

Table 2: Bilateral cooperation based on Article 6.2 of the Paris Agreement

Japan	A bilateral agreement for the implementation of the Joint Crediting Mechanism (JCM) was signed in 2015. As of the end of February 2024,

	51 projects have been adopted as JCM Model Projects under the JCM Financing Programme by the Ministry of Environment, Japan and 11 projects have been registered as JCM projects. (No new projects were adopted or registered during FY2023.)
Switzerland	A bilateral agreement on the implementation of mitigation activities under Article 6 of the Paris Agreement was signed in June 2022. As the first initiative in the bilateral cooperation, it was announced that the two countries will support the 'Bangkok E-Bus Program', a project to convert the fleet of private bus companies operating route buses in the Bangkok metropolitan area from diesel to electric vehicles. In January 2024, the Klik Foundation of Switzerland, which supports the project, also announced that the first Internationally Transfered of Mitigation Outcomes (ITMO) to achieve NDC targets under the Paris Agreement had been transferred from Thailand to Switzerland.
Singapore	In a letter on economic cooperation adopted at the 6th Ministerial Conference on Enhanced Economic Cooperation in Singapore and Thailand held in October 2022, it was announced that the two countries will work together to develop a bilateral cooperation agreement on carbon trading under the guidelines of Article 6 of the Paris Agreement by COP28 in 2023.

Of the 51 projects that have been selected for JCM Model Project to date, renewable energy projects account for the majority, with solar power generation projects accounting for the largest number of 24. On the other hand, solar power generation projects are excluded from the JCM Model Project from the latter half of FY2022 onward. Excluded from the program are ordinary photovoltaic power generation systems in general, such as those installed on roofs, in the field, or on water, but systems that combine storage batteries are considered eligible for the program. As for the Thai government's activities related to overall cooperation under Article 6 of the Paris Agreement, including JCM, since the adoption of Article 6 rulebook of the Paris Agreement at COP26 in 2021, the Thai government reviewed the contents of cooperation under Article 6 of the Paris Agreement and formulated the "Carbon Credit Management Guideline and Mechanism" in March 2022. The document defines the eligible sectors and requirements for Article 6 initiatives and requires that projects contribute to its NDC and LT-LEDS, have regulatory additionality, and involve large-scale investment.

In this project, JCM is assumed to be one of the important exit strategies for project formation. Therefore, these trends were considered during the project identification survey, and we conducted interviews for Thai government officials about the government policy.

(2) Climate change policies of Bangkok

① Bangkok Master Plan on Climate Change

BMA released the “BMA Action Plan on Global Warming Mitigation 2007-2012” in May 2007, and has since been working to develop and implement the "Bangkok Master Plan on Climate Change 2013-2023" and its successor, the "Bangkok Master Plan on Climate Change 2021-2030," with the support of JICA's technical cooperation projects of Phases 1 through 3.

The Bangkok Master Plan on Climate Change covers five sectors, including environmentally sustainable transportation (Transportation Sector), energy efficiency and renewable energy deployment (Energy Sector), waste and wastewater management (Waste and Wastewater Sector), green urban planning (Green Urban Planning Sector), and adaptation planning (Adaptation Sector). Of these, GHG emission reduction targets have been set in four mitigation sectors, excluding the adaptation sector. The "Bangkok Master Plan on Climate Change 2021-2030" sets an overall GHG reduction target of 19% in 2030 relative to BAU and a long-term vision of net zero emissions in

2050. (see table below).

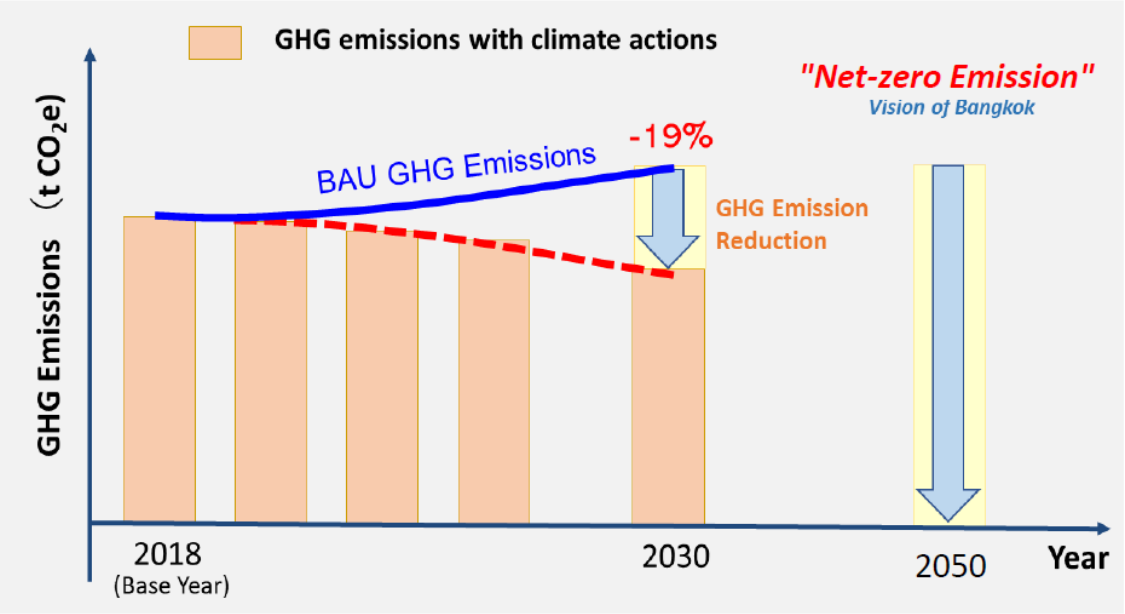


Figure 1: Mitigation targets in the Bangkok Master Plan on Climate Change 2021-2030

The scope of the Bangkok Master Plan on Climate Change includes both the implementation of GHG emission measures in which BMA directly emits emissions (so-called administrative measures section) and the implementation of emission measures by private enterprises and others within the Bangkok region (so-called regional measures section).

In this project, we conducted a study on both facilities owned by the BMA and private facilities for project formation, taking into consideration their potential and feasibility in project formation.

② Implementation structure of climate change policy

The BMA has established the Sub-division for Climate Change Strategies of Department of Environment (CCS) to address climate change in a more organized manner. The CCS, in collaboration with the five sectoral Task Forces (TFs), Working Groups (WGs), Steering Committee (SC), and Joint Coordinating Committee (JCC), plays an important role in coordinating with BMA departments and relevant national agencies. The implementation structure of the Climate Change Master Plan within the BMA is shown in the figure below.

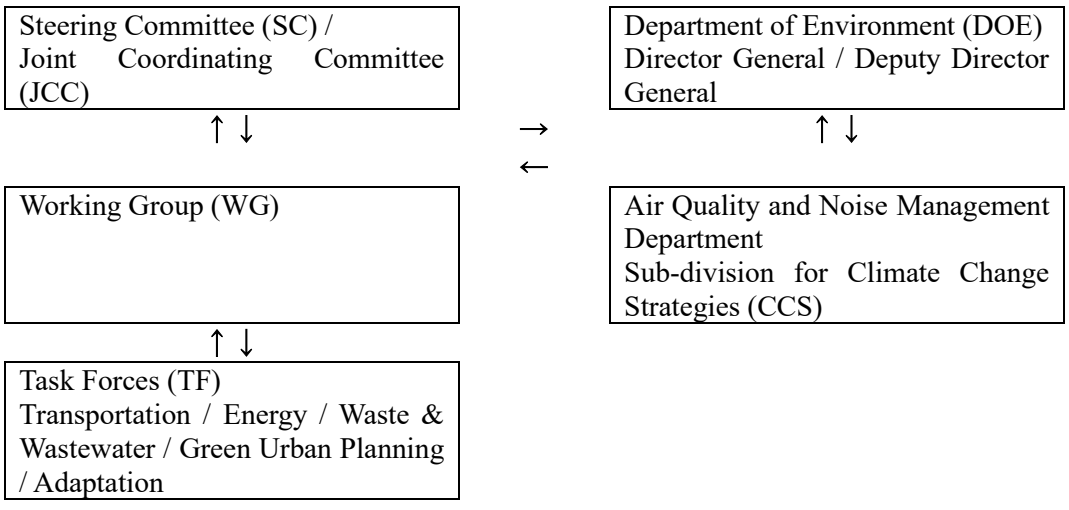


Figure 2: Implementation Structure of Bangkok Climate Change Master Plan

With the CCS and the Department of Environment of BMA as the main counterparts in this project, the expert team discussed the project details and plans in advance, collaborated in conducting surveys and holding workshops, and shared the progress of the project. The workshops and thematic study sessions held under the project were also attended by members of task forces related to the topic (mainly in the energy and transportation sectors) to provide an opportunity for information sharing.

2. Overview of activities

Based on the cooperative relationship between the City of Yokohama and BMA, this project promoted the implementation of the Bangkok Master Plan on Climate Change by strengthening and utilizing public-private partnerships involving the private sector in addition to supporting policy development. Major activities were carried out along the following three activity pillars.

< Three pillars of activities >
(1) Promoting the Climate Change Master Plan
(2) Engaging the private sector
(3) Developing mitigation projects

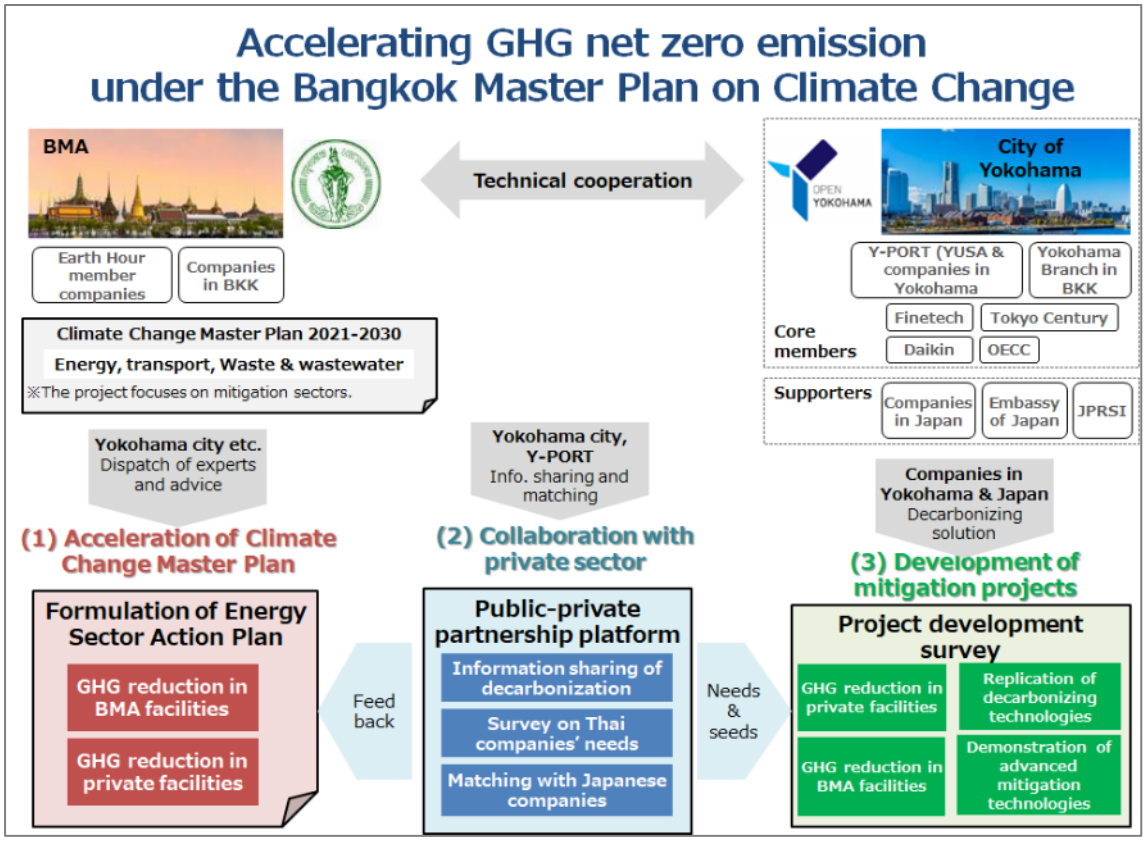


Figure 3: Overall picture of the project

(1) Promoting the Climate Change Master Plan

The BMA is working on planning and implementation of the five sectors covered by the Climate Change Master Plan (energy, transportation, waste and wastewater, urban green planning, and adaptation), but the energy sector is the sector with the highest GHG emissions, making it important to consider detailed actions and implementation plans based on the Master Plan.
In this project, the City of Yokohama and experts team provided support for the preparation of the Energy Action Plan, with CCS and the Energy Task Force of BMA, which is in charge of the energy sector of the Climate Change Master Plan, as the main counterparts. While the development of the Energy Action Plan was initiated in the first year, this year we specifically discussed potential individual mitigation projects to be considered for implementation and proceeded to develop Project Idea Notes (PINs).

(2) Engaging the private sector

In order to reduce GHG emissions from the entire Bangkok area, it is extremely important to promote measures in the private sector, which accounts for the majority of GHG emissions, as well as to address the administrative operations of the BMA.

BMA has been participating in "Earth Hour", an environmental and social campaign organized by WWF involving 190 countries and regions around the world, since 2021. Under this campaign, in addition to promoting and educating the public about energy-saving activities by companies and households, the BMA has concluded a memorandum of understanding (MOU) with 25 companies and organizations in Bangkok to jointly work on GHG reduction and has started a survey on GHG reduction efforts and potentials and monitoring of reduction effects for the 25 companies. “Earth Hour 2021" includes major local companies and organizations such as energy and power (PTT Public Co., Ltd, Metropolitan Electricity Authority, etc.), retail (Central Group, CP All Public Co., Ltd, etc.), public transportation (Bangkok Mass Transit System Public Co., Ltd, etc.), finance (The Stock Exchange of Thailand, etc.), and Japanese companies (Canon Thailand Group, Thai Wacoal Public Co., Ltd.

The City of Yokohama has been working with companies in the city to identify and commercialize projects in emerging countries through the "Y-PORT Project," an international technical cooperation program based on public-private partnerships, and has extensive knowledge in the operation of public-private partnership platforms. In addition, YOKOHAMA URBAN SOLUTION ALLIANCE (YUSA), which was established by small and medium-sized companies in the city in conjunction with the functional enhancement of the Y-PORT project, is a joint implementer of this project, enabling smooth collaboration with YUSA member companies.

Continuing from the first-year project, this project aimed to develop collaboration between BMA and the private sector. Workshops were held with the participation of companies from BMA in Thailand and the City of Yokohama in Japan to share climate change measures by BMA and decarbonization solutions by the private sector, and to provide business matching opportunities between Japanese and Thai companies to form an ongoing public-private partnership platform involving the two cities and related companies.

Because participation in the platform by Japanese companies other than those in Yokohama City would be essential to promote project formation, we actively guided member companies of the Ministry of the Environment's "Japan Platform for Overseas Development of Environmental Infrastructure (JPRSI)" to the event.

An overview of the activities of the Public-Private Partnership Platform is shown in the figure below.

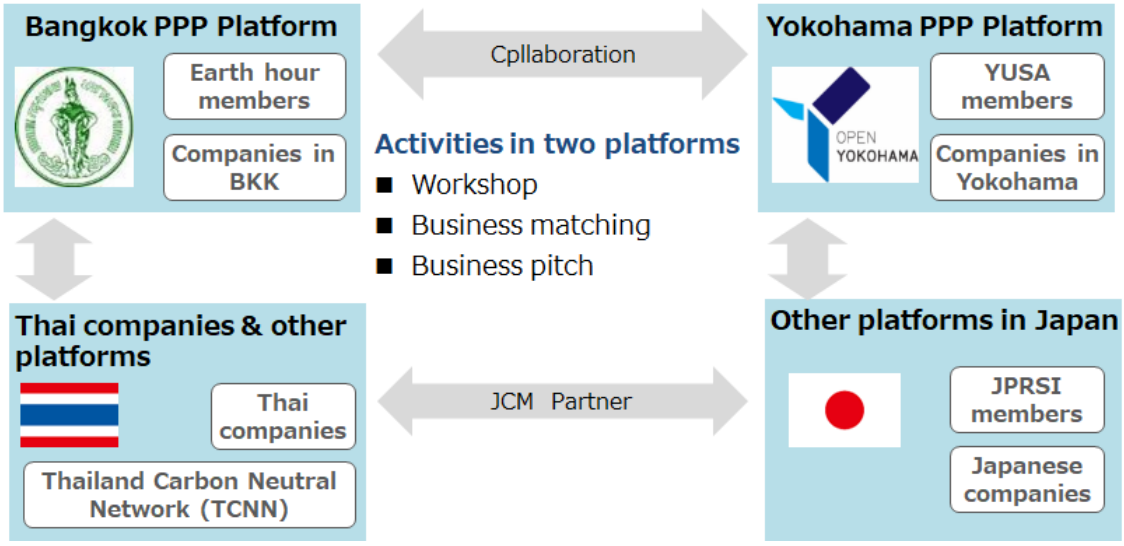


Figure 4: Overview of the activities of the Public-Private Partnership Platform

(3) Developing mitigation projects

In order to realize GHG reduction in Bangkok, it is necessary to build up implementation of energy conservation and renewable energy projects in companies and facilities in Bangkok. This project provided support for matching to form mitigation projects by companies in both countries, surveyed GHG emissions reduction potential, and organized online seminars for companies interested in JCM.

3. Implementation structure

The table below shows the project implementers and their roles in the project.

Table 3: project implementers and their roles

Implementers	Role in the project
City of Yokohama	The City of Yokohama is actively pursuing climate change initiatives and has a "Zero Carbon Yokohama" goal of decarbonization by 2050, and Yokohama has many useful insights for the BMA to use in its decarbonization efforts. Based on the knowledge of climate change policy and the relationship of trust that has been established with the BMA, the City of Yokohama will provide advice on the activities of the public-private partnership and co-host events, provide advice on the formulation of an energy action plan, and support the formation of projects by companies in Bangkok.
BMA	As one of the largest cities in Southeast Asia, Bangkok is required to implement aggressive climate change measures to achieve Thailand's decarbonization goal of 2050 carbon neutrality. BMA will organize events and other activities as part of the public-private partnership, develop an energy action plan, and study mitigation projects at facilities owned by the BMA.
DAIKIN INDUSTRIES, LTD.	Daikin Industries is a top manufacturer of air-conditioning equipment and is extremely well known in Thailand, where it manufactures and sells high-performance, energy-saving air conditioners. In this project, Daikin will consider a mitigation project through the introduction of high-efficiency equipment and energy management based on operation and control technology for the air conditioning facilities of the BMA and private companies' buildings.
Tokyo Century Corporation	In addition to operating 80 solar power plants and wood biomass power generation projects in Japan, Century Tokyo is also actively engaged in overseas expansion, particularly in the promotion of environmental equipment through the JCM Financing Programme. The company will consider forming mitigation projects and providing financing by leveraging its leasing services and ESCO business in Thailand, as well as its extensive experience in the JCM financing Programme.
Finetech CO., LTD.	Finetech Co., Ltd. conducts environmental and renewable energy projects in Thailand as an R&D-oriented company. Finetech will focus on survey to identify projects by utilizing experience of the JCM Model Project in Thailand and local network in the renewable energy field.
Yokohama Urban Solution Alliance (YUSA)	YUSA is an organization established to strengthen the functions of the Y-PORT Project, Yokohama's international technical cooperation through public-private partnership, with the aim of expanding

	overseas infrastructure business opportunities for companies in the city and contributing to solving urban issues in emerging countries. YUSA will coordinate the matching of member companies and their participation in the public-private partnership platform, and support the formation of mitigation projects by member companies.
Overseas Environmental Cooperation Center, Japan (OECC)	OECC has conducted a number of technical cooperation projects related to climate change in Asian countries, including Thailand, as well as various surveys, project identification, and project implementation support. OECC will liaise and coordinate among the stakeholders of the project and manage the progress of the project, taking advantage of its experience in supporting the formulation and implementation of the Bangkok Master Plan on Climate Change under the JICA Technical Cooperation Project and its close network with the BMA and Thai counterparts.

The implementation structure of the project is shown in the figure below.

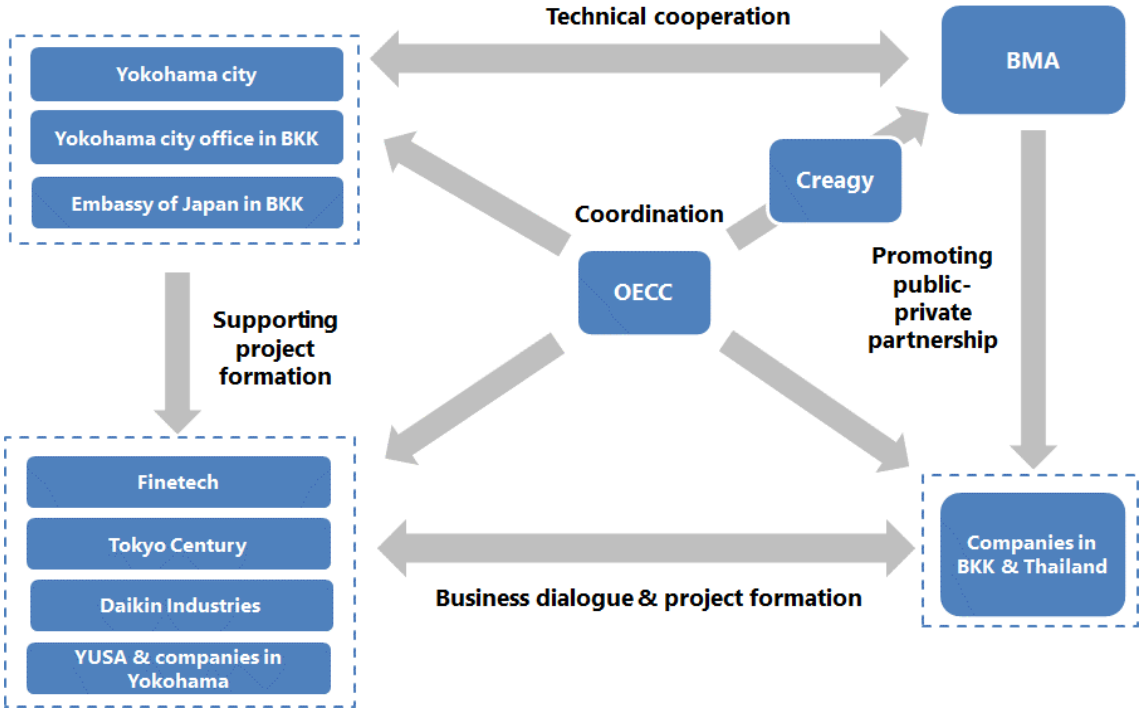


Figure 5: Implementation structure of the project

III Result of activities

The activities and results of each of the three pillars of activities implemented in this project are shown as following. In addition, major activities such as workshops, meetings, and onsite surveys are listed in chronological order in the table below.

Table 4: Workshops, conferences and meetings, and field trips

Date	Activities
July 4, 2023	Kick-off meeting with BMA and the City of Yokohama in Thailand: Project details and plans were discussed and agreed upon by the parties concerned, including the International Bureau of the City of Yokohama, Department of Environment of BMA, and OECC.
July 4, 2023	Courtesy visit to the Governor of BMA: The International Bureau of the City of Yokohama and OECC paid a courtesy visit to the Governor of BMA to confirm the renewal of the Intercity Agreement between Yokohama and BMA.
July 11, 2023	Kick-off meeting with the Ministry of Environment, Japan in Thailand: The progress and schedule of this project were reported to and discussed with the Ministry of Environment, Japan.
Early July, 2023	Field survey: We conducted company and factory visits and interviews to identify projects.
September 6, 2023	Briefing on projects of the Ministry of Environment, Japan for the Japanese Chamber of Commerce Bangkok in Thailand: A briefing session was held for member companies of the Chamber's Environment Subcommittee on the Ministry of the Environment's projects, such as the City-to-city collaboration project and JCM.
September 14, 2023	Meeting with concerned parties to organize a City-to-city collaboration workshop in Thailand: We discussed the structure and content of the workshop with BMA.
Early September, 2023	Field survey: We conducted company and factory visits and interviews to identify projects.
September 22, 2023	Briefing on City-to-City Collaboration Projects for Companies in Yokohama City in Japan: The project overview and information on the workshops were provided to companies in Yokohama City.
October 18, 2023	3rd Workshop on "Net Zero Emissions Business Opportunity under Bangkok-Yokohama City-to-City Program" in Thailand: BMA, the City of Yokohama, and Japanese and Thai companies participated in sharing and business matching regarding BMA's climate change measures and corporate decarbonization solutions.
Mid-October 2023	Field survey: We conducted company and factory visits and interviews to identify projects.
Mid-November, 2023	BMA Governor's visit to Japan: The Governor of BMA visited Japan to participate in the Asia Smart City Conference hosted by the City of Yokohama, and to visit and observe facilities and companies in Yokohama city.
December 14, 2023	Guidance on the JCM project for Thai companies in Thailand: We organized a seminar for Thai companies interested in JCM, focusing on the JCM Financing Programme.

Mid-December, 2024	Field survey: We conducted company and factory visits and interviews to identify projects.
January 19, 2024	Meeting with the Governor of BMA: A courtesy visit was made to the Governor of BMA by the Director General and the Director of the International Bureau of the City of Yokohama, and the OECC to explain the future plans of this project.
January 19, 2024	Organizing a study session for BMA officials in Thailand: A study session was held for BMA officials, covering topics such as perovskite solar cell technology, EV truck trends, and City of Yokohama's climate change action plan for sector-specific measures and urban development.
March 1, 2024	Final report to the Ministry of the Environment on online
March 8, 2024	Presentation at Y-PORT Workshop

1. Formulation of an energy action plan

(1) Positioning of the Energy Action Plan

Along with the transportation sector, the Bangkok Master Plan on Climate Change places emphasis on GHG emission reduction efforts in the energy sector. In the energy sector, GHG emissions are to be reduced to 28.33 million t-CO2e in 2030, a 16% reduction (5.55 million t-CO2e) compared to BAU. On the other hand, these mitigation targets are based on the Energy Efficiency and Development Plan (EEDP) and Alternative Energy Development Plan (AEDP) scenarios under the NDC of the Thai government, prorated to the Bangkok area level, and need to be incorporated into more specific activities and measures to be reflected in substantive GHG emission reduction. New Governor Chadchart also expressed his intention to make the GHG emissions directly attributable to the BMA (the "administrative part" in Japan's local climate action plan) as carbon neutral as possible during his term of office after he takes office in June 2022. In response to this, for this fiscal year's project, a quantitative evaluation of GHG emissions from facilities belonging to the BMA (metropolitan and ward government buildings, metropolitan hospitals, etc.) and a study of measures to deal with them were conducted in the Energy Action Plan.

(2) Development of Energy Action Plan

(Purpose of the Energy Action Plan)

- Determination of the implementation framework and direction at the action level to effectively reduce greenhouse gases in Bangkok's energy and transportation sectors.
- Determination of energy and greenhouse gas reduction targets in accordance with the measures stipulated by the Bangkok Metropolitan Government (2021-2030) regarding climate change.
- Guidelines for BMA and Thai government agencies to work together in a common direction and help establish continuity and durability.
- Facilitating the relationship process between BMA and related institutions in the private and public sectors.

(Vision for climate change)

- Bangkok's vision for climate change 2030
  Bangkok aims to create a green city for sustainable development, with all sectors working together to combat climate change.
- Bangkok's vision for climate change 2050
  Bangkok will continue to strive to achieve net zero greenhouse gas emissions, achieve sustainable innovation, and transform every aspect.

(GHG reduction guidelines for energy and transportation sectors)

- Reducing and avoiding unnecessary power consumption: Reducing energy consumption without new investments. Reduce unnecessary power usage by turning off lights and air conditioning when not needed. Raise the air conditioning temperature to 1-2℃. Reduce the use of cars for short-distance transportation.
- Improving power usage efficiency by replacing with high-performance devices: Particularly in lighting and air conditioning systems, power consumption can be significantly reduced by improving power efficiency by replacing parts with high-performance devices.
- Transition of power sources including renewable energy
- Promoting the conversion of fuel to electricity, focusing on the introduction of rooftop solar power generation in urban areas.

Energy and Transport Sector are the most significant contributors to GHG emissions in Bangkok

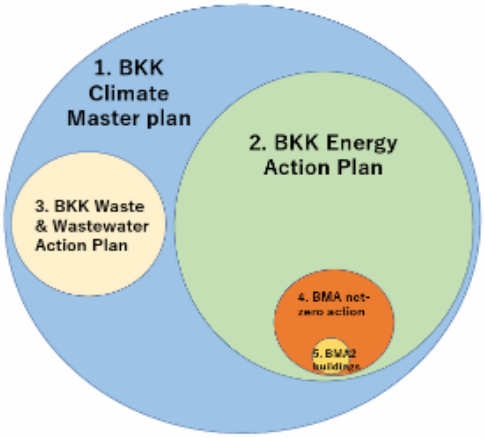
Unit: $MtCO_2e$

Sector	GHG inventory in 2018 (BASIC)	GHG Emissions in 2030 Business-as-usual (A)	GHG mitigation reduction target in 2030 (B)	GHG Emissions in 2030 after mitigation (C) = (A-B)	GHG Reduction (%) (D) = (B/A)
Transport	12.65	14.26	4.00	10.26	28%
Energy	25.74	33.73	5.55	28.18	16%
Waste	5.67	6.14	0.6	5.54	10%
Total (Emission)	**44.06**	**54.13**	**10.15**	**43.98**	**19%**
AFOLU / Green Urban Planning	NE*	NE	0.01**	NE	NE

Remark:
- *GHG emissions from Agriculture, Forestry and Other Land Use (AFOLU) sector are excluded
- ** GHG absorption of Green Urban Planning measures in Bangkok

Figure 6: Status of GHG emissions in the energy and transportation sectors

Therefore, it is crucial to develop the Bangkok Energy Action plan to guide the investment and partnership opportunities



1. **Support the implementation of BKK Climate Master Plan**
   - Engage private sectors and create partnership for low carbon investment
   - Enhance technology transfer and knowledge sharing between Bangkok-Yokohama
   - Decarbonize corporates' supply chains and enhance net-zero targets of stakeholders in Bangkok
2. **Development of BKK Energy Action Plan**
   - Create detailed energy action plan
   - Create list of project idea notes for potential fundings from domestic and international funding sources (e.g. JICA, IFC, ADB ,etc)
3. **Development of BKK Waste & Wastewater Action Plan** (similar to BKK Energy Action Plan structure)
4. **Quick Win: BMA net-zero action (focusing on energy measures)**
5. **Quick Win: BMA2 Building net-zero action**

Figure 7: Positioning of the Energy Action Plan

(Schedule)

- The draft action plan will be coordinated among related parties on November 16, 2023.
- Discussed at the TF meeting centered on Bangkok held on November 30th.
- The contents will be discussed and finalized at an SC meeting that will include national government officials.
- After that, it will be confirmed after going through the Bangkok Metropolitan Government internal approval procedure.

(Specific activities)

As part of the implementation phase of the Energy Action Plan, we will work on the following:

- The Bangkok Metropolitan Government will work to secure a budget for the introduction of rooftop solar power, especially in order to reduce emissions from buildings owned by the Bangkok Metropolitan Government.
- If it is difficult to secure a budget, I have heard that they are considering introducing a method similar to a leasing business in cooperation with the Metropolitan Electricity Authority (MEA), which is an electric power company.
- Regarding improving the efficiency of air conditioning equipment in buildings owned by the

Bangkok Metropolitan Government, we will work with JICA and IFC to consider improving the efficiency of air conditioning equipment in buildings owned by the Bangkok Metropolitan Government as part of next year's intercity collaboration project.

- We will continue to consider the expansion of the introduction of JCM's equipment introduction subsidy system in next year's intercity collaboration project.
- We also plan to consider promoting the introduction of EV motorcycles as a GHG reduction measure in the transportation field as part of next year's intercity collaboration project.
- Similarly, with regard to considering the introduction of intra-city cableways as a GHG reduction measure in the transportation field, we will conduct a feasibility study on specific routes and profitability based on the survey results conducted by JICA in 2022. We plan to proceed with the investigation as part of the collaborative project.
- Regarding the Energy Action Plan, MRV will support the Bangkok metropolitan side in intercity collaboration projects.

2. Engaging the private sector

(1) 3rd Workshop on Net Zero Emission Business Opportunity under Bangkok-Yokohama City to City Program

3rd Workshop on Net Zero Emission Business Opportunity under Bangkok-Yokohama City to City Collaboration Project was held in BMA and online on October 18, 2023.
The third workshop was organized to 1) publicize the progress of climate change-related planning and implementation based on the Bangkok Climate Change Master Plan 2021-2030, 2) present the framework of the Bangkok Energy Action Plan and collect feedback from participants, 3) share and exchange knowledge on low-carbon and decarbonization solutions between Japan and Thailand, an GHG reduction projects between the Thai and Japanese private sectors. Specifically, four sessions of presentations and discussions were held on the topics of " Bangkok Climate Actions," " Bangkok Energy Action Plan," " Carbon markets and Article 6 cooperation and opportunities for private sector in Thailand," and " Opportunities for Decarbonizing Cities," as well as business matching.
The workshop's outline is as follows.

Organizers: City of Yokohama, BMA, Ministry of the Environment, Japan, OECC
Date: Wednesday, October 18, 2023
Venue: Hotel in Bangkok Metropolitan Administration and online (Zoom)
Language: Japanese-Thai (simultaneous interpretation)
Program:
Session 1: "Climate Change Policy and Implementation of BMA
Session 2: "Consultation on BMA's Energy Action Plan
Session 3: "Thailand's Carbon Market and Bilateral Crediting Mechanism (JCM) Trends
Session 4: "Opportunities for Urban Decarbonization (Business Pitches)
Business Match: Meetings with Business Pitch speakers
Participants: Thai companies, Japanese companies, BMA and City of Yokohama officials, etc.
Approximately 200 participants in person and 70 participants online from Japan and Thailand.

One of the main changes from the second workshop held in the previous fiscal year was that the third workshop featured business pitches from 11 Japanese and Thai companies in Session 4, with the aim of promoting exchanges and project formation between Japanese and Thai private companies. In addition, a space was set aside for the speakers and other workshop participants to freely meet with each other, providing an opportunity for business matches at the end of the workshop. The business matches lasted one to two hours, with several companies visiting each speaker for a lively interview.
The workshop's agenda is as follows.

Time	Activities
8:30 - 9:00	Registration
9:00 - 9:30 (30 mins)	Welcoming remarks by Mr. Toru Hashimoto, Director General of International Affairs, City of Yokohama (Online) (5min) by Mr. Yutaka Matsuzawa, Vice Minister for Global Environmental Affairs, Ministry of the Environment, Japan (Video message) (5min) by Mr. Takuro Tasaka, Minister for Economic Affairs, Embassy of Japan (TBC) (5min) Opening remarks by Mr. Chadchart Sittipunt, Governor of Bangkok (TBC) (10min) Group photo (5min)

Time	Activities
9:30 - 10:10 (40 mins)	Session 1: Bangkok Climate Actions Presentation: Progress on Climate Actions under BMA (15 mins) Presentation: Progress on Climate Actions under BMA (15 mins) Re-cap on Bangkok Master Plan on Climate Change BMA Net-Zero Plan Success Stories and Lessons Learned by Department of Environment, BMA Presentation: Future Plan of Bangkok Climate Actions (15 mins) Future plan and overall targets by sectors Breakdown of metrics, annual targets, and key milestones by Creagy Co., Ltd. Q&A (10 mins)
10:10 - 10:25 (15 mins)	Break
10:25 - 11:55 (90 mins)	Session 2: Bangkok Energy Action Plan Presentation: Conceptual Framework (30 mins) Q&A (10 mins) by Creagy Co., Ltd. Consultation: Potential projects & Investment Opportunities (40 mins) Moderate by Creagy Co., Ltd. (Tools: Mentimeter) Wrap-up (10 mins)
11:55 - 13:00 (65 mins)	Lunch
13:00 - 14:00 (60 mins)	Session 3: Carbon markets and Article 6 cooperation and opportunities for private sector in Thailand Presentation: Carbon markets development and Article 6 cooperation in Thailand by TGO Presentation: JCM opportunities in Thailand by OECC Presentation: Carbon Credits Activities of Tokyo Century by Tokyo Century Presentation: Corporate net-zero strategy with nature-based solutions by Mae Fah Luang Foundation Q&A (15 mins)

Time	Activities
14:00 - 15:10 (70 mins)	Session 4: Opportunities for Decarbonizing Cities Series of presentation on decarbonization solution from Japanese and Thai companies Presentation: Expectations for public-private cooperation in intercity cooperation by City of Yokohama Business pitch: Daikin: Carbon Neutrality Solution: Healthy and Energy Efficient Air Conditioning(AC) system for ASEAN market AGC: Energy Saving and Energy Generating by Window Azbil: The Unique Energy Conservation Technology & Service ~ BEMS & ESCO AltoTech(Thailand) Co.,Ltd.: AI/IoT for energy management Nissan：Carbon neutral Activity with EV&V2X Macnica: Macnica Mobility. Moving people for better life ETRAN (Thailand) Company Limited: E-Bike service FOMM: First One Mile Mobility (EV) Bright Management Consulting: Energy audit and JCM project survey Zeroboard: Corporate GHG calculation and disclosure LEET Carbon: Data-driven solutions and Nature-based carbon capture
15:10 - 15:20 (10 mins)	Closing remarks by BMA
15:20 - 15:30 (10 mins)	Break
15:30 - 17:00	Business matching

Opening remarks: Governor of BMA


Opening ceremony: BMA & Embassy of Japan


Opening remarks: City of Yokohama


Opening remarks: Ministry of the Environment

Session 1: BMA

Session 2: Creagy

Session 3: Discussion

Business match

Group photo

Conference venue

(2) Seminar with Japanese Chamber of Commerce, Bangkok

With the support of the Japanese Chamber of Commerce, Bangkok and the Embassy of Japan in Thailand, a seminar was held for member companies of the Environmental Committee of the Japanese Chamber of Commerce, Bangkok to introduce various programmes implemented by the Ministry of the Environment, Japan in order to expand the involvement of Japanese private companies in the City-to-city collaboration project. The following prrogrammes of the Ministry of the Environment, Japan were introduced at the seminar.

- Explanation of the status of selection of the JCM projects in Thailand, ideas for promoting utilization of the JCM, GHG reduction and subsidy amounts, and application procedures in order to promote active utilization by Japanese companies.
- Details and activities of the “Japan Platform for Redesign: Sustainable Infrastructure (JPRSI)”, which was established in 2020 as a platform to support the activities of Japanese private companies and various parties actively involved in the overseas development of environmental infrastructure.
- Support for the overseas deployment of Japanese private companies through the City-to-city collaboration project between Yokohama and Bangkok funded by the Ministry of the Environment, Japan.
- Projects such as “Partnership to Strengthen Transparency for co-Innovation (PaSTI)” to improve transparency of the private sector in developing countries

(Outline of the seminar)
Date and Time: Wednesday, September 6, 2023, 10:00 - 12:30 (doors open at 9:30)
Method: Pysical and online
Venue: Main Conference Room of Japanese Chamber of Commerce, Bangkok
Organized by: Environment Committee of Japanese Chamber of Commerce, Bangkok
Co-organized by: Overseas Environmental Cooperation Center (OECC), Embassy of Japan in Thailand
Seminar format: Physical and online
Venue: Conference room of the Japanese Chamber of Commerce
Hosted by: Environmental Committee of the Japanese Chamber of Commerce, Bangkok
Co-sponsored by: OECC, Embassy of Japan, Thailand
Program:

Time	Agenda
10:00-10:10	Opening <Opening remarks> Japanese Chamber of Commerce, Bangkok <Opening remarks> Embassy of Japan in Thailand
10:10-10:45	Overview of Ministry of the Environment's support for overseas deployment of environmental infrastructure Mr. Kimihiro Kuromizu. OECC JPRSI's efforts to support companies in Thailand for deployment of environmental infrastructure Mr. Jun Ichihara. IGES (online) City-to-city collaboration project between Yokohama and Bangkok Challenges and activities on survey for GHG emission in supply chain Mr. Kimihiro Kuromizu. OECC
10:45-11:25	JCM and JCM Financing Programme Mr. Jun Watanabe, OECC
11:25-11:40	Q&A
11:45-11:50	<Closing remarks> Japanese Chamber of Commerce, Bangkok
11:50-	Lunch meeting


Seminar


Speakers

3. Developing mitigation projects

(1) Outline of potential projects

To identify and formulate mitigation projects, OECC collaborated with the project's co-implementers and Japanese companies to conduct activities such as business trips to meet with local companies, online interviews, site visits, development of project implementation model, and preparation for the use of JCM Financing Programme. The table below outlines the candidate projects that were identified this usrvey.

Table 5: Summary of relaized projects

1. Installation of rooftop solar power generation system in university 【Outline】 A 1MW rooftop solar power generation system will be installed at a university campus in Thailand. The project is supported by FINETECH, a co-implementer of this project, and has already been decided to be implemented as a joint venture between a Japanese company and a Thai company. Since this is a solar power generation project, it is not eligible for the JCM in Thailand. Therefore, the project will not utilize the JCM Finacing Progrrame, but will be implemented on a business basis.
2. Installation of solar power generation system in Srilanka 【Outline】 The project will install a 13.5 MW solar power generation system in the North Central Province of Sri Lanka, and was selected as one of the third selection of the JCM Financing Programme in fiscal year 2023, "13.5MW Solar Power Project in Kebithigollewa, North Central Province". The project is implemented by Shibata Shoji, a Japanese company, as the representative participant, with Windforce, a Sri Lankan company as a co-participant. OECC and FINETECH provided support application to the JCM Financing Programme. In addition, the surveys and the business matching in the workshop under this city-to-city collaboration project contributed to the realization of this project.

Table 6: Summary of potential projects

3. Energy saving in a metal manufacturing factory 【Outline】 A Japanese company in an industrial park has an investment plan to build a new metal manufacturing factory from 2024 to 2025. The factory will melt and recycle scrap metal, and burners and furnaces that use natural gas as fuel will be installed for metal melting. By installing energy-saving burners and furnaces, the factory will be able to reduce the amount of natural gas used compared to conventional facilities, and is considering applying for the JCM Financing Programme. OECC has proposed the JCM Financing Programme to the factory owner, estimated the amount of natural gas and GHG reduction, and studied reference scenarios of the potential JCM project. 【Plans】 In preparation for application to the JCM Financing Programme in fiscal year 2024, OECC will organize existing data to establish reference scenarios, and develop an implementation structure and prepare materials for the application.
4. Energy saving in a factory in AMATA industrial park 【Outline】 The factory of Company B, a Japanese-affiliated company that manufactures daily necessities, is quite large and well managed, but the facilities themselves are old, and the factory is considering large-scale renovations. Based on the results of an on-site survey, OECC made a proposal to utilize the JCM Financing Programme, and is discussing the matter with the headquarter.

【Plan】
While the Thai factory is positive about utilizing the JCM Financing Programme, the Japanese headquarter has requested that the impact of carbon credit creation and the implementation period of the JCM Model Project be systematically organized before considering the use of JCM.

5. Energy saving of chiller in a complex commercial facility

【Outline】
One of the commercial complexes (including a supermarket, department store, gym, and movie theater) operated by the Central Pattana Group, which develops and operates commercial facilities, was built about 30 years ago. Based on the results of an on-site survey, OECC proposed a plan to replace the existing chillers with high-efficiency chillers. The refrigerant used in the existing chiller is high-GWP refrigerant, and since refrigerant emissions from the existing chiller are expected to occur when the facility is upgraded, the recovery and destruction of refrigerant and the reduction of refrigerant leakage by installing a low-GWP refrigerant chiller are also factors to be considered when developing a JCM project.

【Plan】
Since the company owns several large facilities, OECC will continue to consider bundling other facilities into one project.

6. Biogas power generation utilizing wastewater from the Cassava processing plant

【Outline】
Thai company D (manufacturer) has a need for a biomass power generation project that effectively utilizes biomass waste derived from a cassava processing plant, FINETECH, has been conducting a technical study. In this project, Finetech introduced the JCM Financing Programme and supported the matching with the representative company on the Japanese side. Company D is now comparing the benefits of other schemes such as T-VER.

【Plan】
Details of the expected amount of the subsidy and challenges towards application to the JCM Financing Progrrame will be surveyed.

7. Energy saving through the replacement of equipments in a water treatment facility

【Outline】
The Bangkok Metropolitan Waterworks Authority has energy-saving needs through the renewal of pumps and other equipment at its aging water treatment facilities, and is considering conducting a study of the energy-saving potential of the facilities, assuming that Japanese company E will install the equipment.

【Plan】
In Fiscal year 2024, OECC will conduct an on-site survey and study the requirements and challenges for applying to the JCM Financing Programme.

(2) Horizontal deployment of decarbonization technologies and business models to chain stores and facilities

The Central Pattana Group operates and manages 38 shopping centers (15 in Bangkok metropolitan area, 22 in rural areas, and 1 in Malaysia), 10 office buildings, 2 hotels, 22 residential projects, and 17 community malls, and is considering measures in the areas of green building technology, energy efficiency improvement technology, and water and wastewater management technology for these facilities. The group aims to achieve net-zero emissions by 2050 and goals in line with the SDGs, and is considering measures in the areas of green building technology, energy efficiency improvement technology, and water and wastewater management technology in its facilities. In this project, the needs and issues are first identified for the " 5. Energy saving of chiller in a complex commercial facility" project listed in Table 6. In addition, we are discussing with headquarter for compiling the needs for equipment renewal and energy saving of other commercial complexes to consider the application of the JCM Financing Programme.

In addition, as a result of other survey, we were able to identify businesses and factories in the vicinity of Bangkok that consume large amounts of energy and have been in operation for a long time, as shown in the table below, and we will use this information to consider forming large-scale projects in the future.

Table 7: Facilities having potentials of GHG emission reduction

Industrial facility			Commercial facility		
Location	GHG emission tCO2	Age of building	Location	GHG emission tCO2	Age of building
Nakhon Pathom	100,306.53	19	Bangkok	86,622.33	109
Pathum Thani	98,254.74	36	Bangkok	61,276.74	18
Bangkok	97,279.31	49	Bangkok	51,245.25	24
Bangkok	76,217.40	14	Samut Prakan	36,271.83	11
Samut Prakan	70,251.07	33	Bangkok	32,069.08	49
Nakhon Pathom	63,616.17	51	Pathum Thani	31,409.48	28
Samut Prakan	59,860.63	22	Bangkok	29,994.00	41
Saraburi	54,281.53	55	Bangkok	27,871.98	34
Nonthaburi	52,123.07	21	Bangkok	25,181.83	29
Nakhon Pathom	46,319.86	31	Bangkok	22,566.49	29
Samut Sakhon	39,655.44	31	Bangkok	22,400.52	28

(3) Consideration of Mitigation Project toward Net Zero in Bangkok

As a mitigation measure for net zero in BMA, the Project Team collected information on the activities of the office business segment directly emitted by BMA itself. The Team supported the development of Project Idea Notes (PINs) under the Draft Energy Action Plan that the Energy Task Force is considering.

In addition, the Project Team supported the elaboration of measures by the Waste and Wastewater Task Force in collaboration with the Measurement, Reporting, and Verification of GHG Emissions (MRV) in the waste sector, which was assisted by the Transparency Partnership for Co-Innovation (PaSTI) implemented of the MOEJ. As a result of the support, the BMA gave the following project proposals.

Sector	Project ideas
Energy sector	Renewal of Air-Conditioning Equipment at BMA Metropolitan Government Buildings and Wards※ Installation of Solar Panels at BMA Metropolitan Government Buildings Air Conditioning Temperature Setting Campaign
Waste and wastewater sector	Quantitative Evaluation of Sorted Collection Measures in BMA Metropolitan Government Building Construction of Incineration Disposal Plant (1 Machine Planned) Introduction of EV for waste collection (lease scheme, etc.) Energy saving by upgrading pump facilities at sewage treatment plants

*Details of the project on renewal of Air-Conditioning Equipment is described in following chapter '(7) Study on recovery and destruction of used refrigerants (HFCs, etc.) following renewal of air conditioning systems'.

(4) Consideration on installement of new technology (perovskite solar power generation)

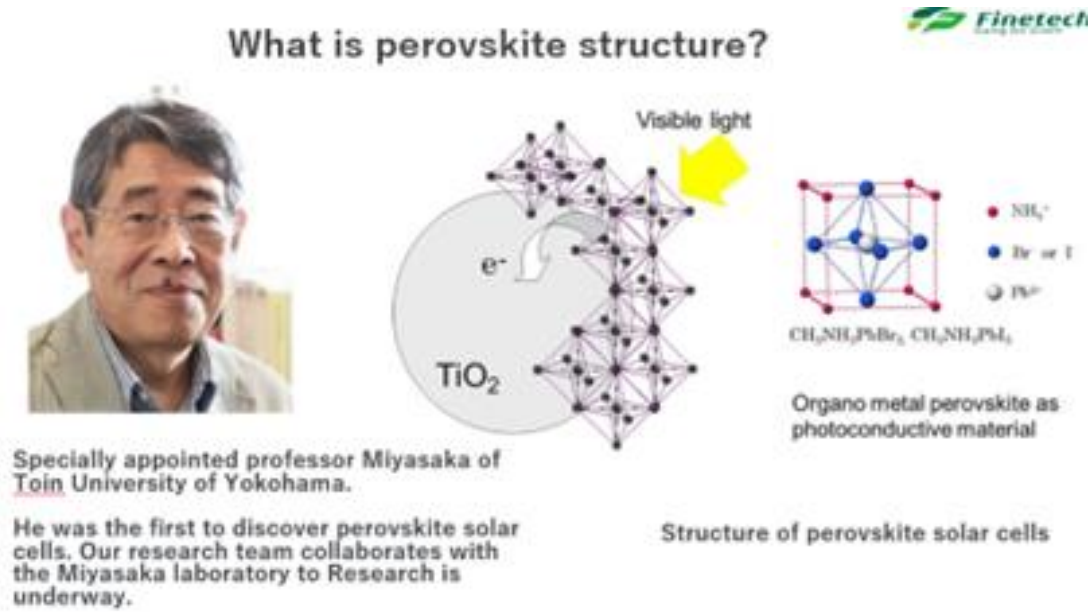
In order to share with the BMA the knowledge of perovskite solar cells that the City of Yokohama is implementing in collaboration with private companies in the city, we introduced perovskite solar

cell technology, especially for the members of task force on energy sector of BMA.

Perovskite solar cells, a new technology originating in Japan, are characterized by the following features: they can be manufactured using fewer manufacturing processes (lower manufacturing cost) than existing solar cells, lightweight substrates such as plastic can be used to ensure lightness and flexibility, and Japan accounts for 30% of the world's production of iodine, the main material used for perovskite solar cells, and it is expected to be highly competitive with silicon-based solar cells. In the future, as the combination (tandem) of different types of solar cells, such as silicon solar cells and compound solar cells, progresses, the performance is expected to greatly surpass that of silicon solar cells.

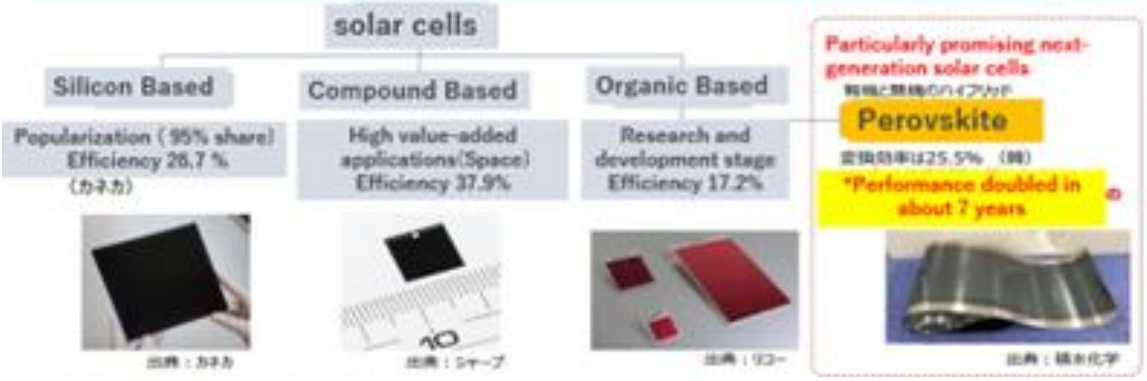
A company headquartered in Yokohama, Japan, has been developing thin, bendable, next-generation "perovskite" solar panels with interchangeable modules, and introduced a demonstration project which will be started in the Port of Yokohama Osan Bridge in the spring of 2024. The purpose of the experiment is to determine the durability of the panels against salt damage when installed on a pier, and if they can be deformed into the shape of a building when installed on a building, whether they can demonstrate sufficient performance, including durability.

However, there are currently issues such as short life span (low durability), difficulty in scaling up, and further improvement of conversion efficiency, but many research institutes and companies are conducting R&D and these issues are expected to be resolved in the near future. We were able to convey the great potential of mass adoption without concerns about the load on building walls, etc., even in a large city like Bangkok. Project side and BMA discussed seizing the opportunity and continue to consider the possibility of conducting active introduction experiments and involving the private sector to introduce the system to buildings in BMA.



About various solar cells

Organic perovskite solar cells have achieved dramatic growth over the past 10 years, with conversion efficiency about twice as high (approximately four times faster than silicon-based solar cells). It is seen as a promising battery



(5) Knowledge transfer of Minato Mirai 21 (decarbonization leading region)

We discussed the details of the case study and its concept in order to share with Bangkok Metropolitan Administration the efforts toward carbon neutrality by 2050 in the Minato Mirai district (MM21 district) of Yokohama, which has been selected as a leading decarbonization area. Yokohama is the first city in Japan to declare a decarbonization target, aiming to achieve net zero GHG emissions by 2050, with the additional target of 50% reduction by 2030. Specific initiatives include, among others, converting 100% of electricity consumption to renewable energy to reduce GHG emissions in its own operations, achieving 100% renewable energy in the new main city hall building (using electricity generated by the waste incineration plant), and converting 100% of the city's official vehicles to Low Emission Vehicle (LEV) by 2030 (EVs, PHVs The city will achieve 100% LEV (EV, PHV, fuel cell vehicle, HV) by 2030, 100% LED lighting by 2030, solar power generation and storage batteries on the roofs of 71 schools, and additional storage batteries on the roofs of 65 elementary and junior high schools. We have introduced these efforts to BMA officials taking into consideration measures implemented under the strong leadership by the Governor of the BMA. In addition, we also introduced achievements in Yokohama such as that Yokohama's new city hall has achieved a planned energy saving rate of over 50% (ZEB Ready) by introducing various environmental technologies, and has achieved 100% renewable energy electricity (RE100) by using electricity generated at the city's waste incineration plant and electricity generated from facility which has expired FIT (Feed-in-Tariff) application. At the same time, we could support BMA to understand that efforts to reduce RE100 and GHG emissions to zero are necessary but very difficult, and will require BMA to continue to encourage more aggressive action in the preparation and implementation of the Energy Action Plan.

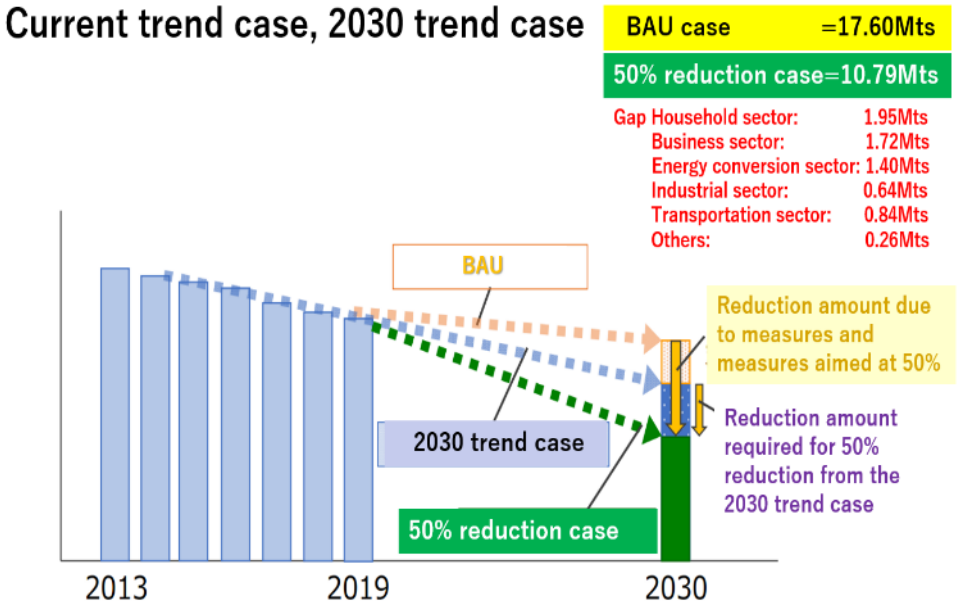


Figure 8: Status of GHG emissions in City of Yokohama

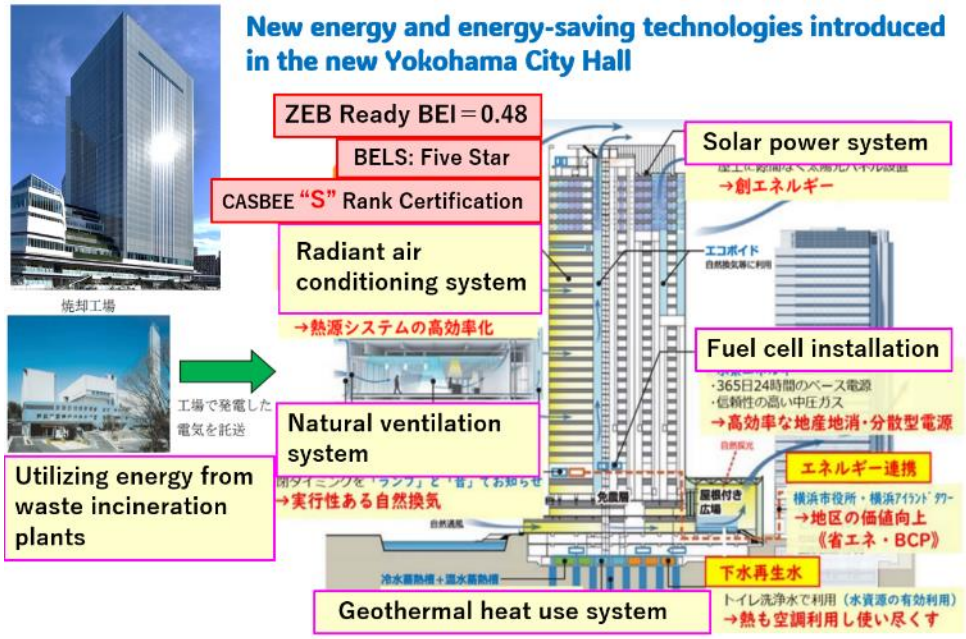


Figure 9: Energy efficiency and renewable energy measures City hall of Yokohama

(6) Consideration on V2G demonstration project

The installation of a charging/discharging equipment and the introduction of an EV at the BMA's Building were considered as a reverse power flow V2G demonstration project to connect the EV to the power grid implemented jointly by the Japanese automobile company and the Electricity Generating Authority of Thailand (EGAT). However, the demonstration project could not be implemented due to issues related to facility management by the BMA regarding the installation of charging/discharging equipment.

On the other hand, we have started consideration of cooperation with Japanese automakers and their affiliated trading companies that are developing EV business in Thailand, and are discussing the possibility of technology demonstrations and other projects under the city-to-city collaboration project. The trading companies see that the promotion of EVs is essential to reduce GHG emissions from the transportation sector since it is necessary to electrify vehicles and reduce electricity consumption rate. We will continue to explore business opportunities with the private sector and the BMA in Thailand.

(7) Study on recovery and destruction of used refrigerants (HFCs, etc.) following renewal of air conditioning systems

In the Bangkok Climate Change Master Plan and the Energy Action Plan, which is a subordinate plan of the Master Plan, BMA's own administrative business listed energy conservation of air conditioning as an important measure to reduce GHG. According to the survey conducted in this work, air conditioning accounts for 59% of the energy used by BMA in its office work, and about 37,000 small-scale air conditioners are used inefficiently. Therefore, in this year's project, we conducted a survey on the renewal of air conditioning equipment. In Thailand, recovery and destruction of used refrigerants are not generally performed, but R401A (HFC401), the main refrigerant, has a very high global warming coefficient of 2,090, and it can be expected to have an even greater mitigation effect by avoiding releasing it into the atmosphere when air conditioners are renewed.

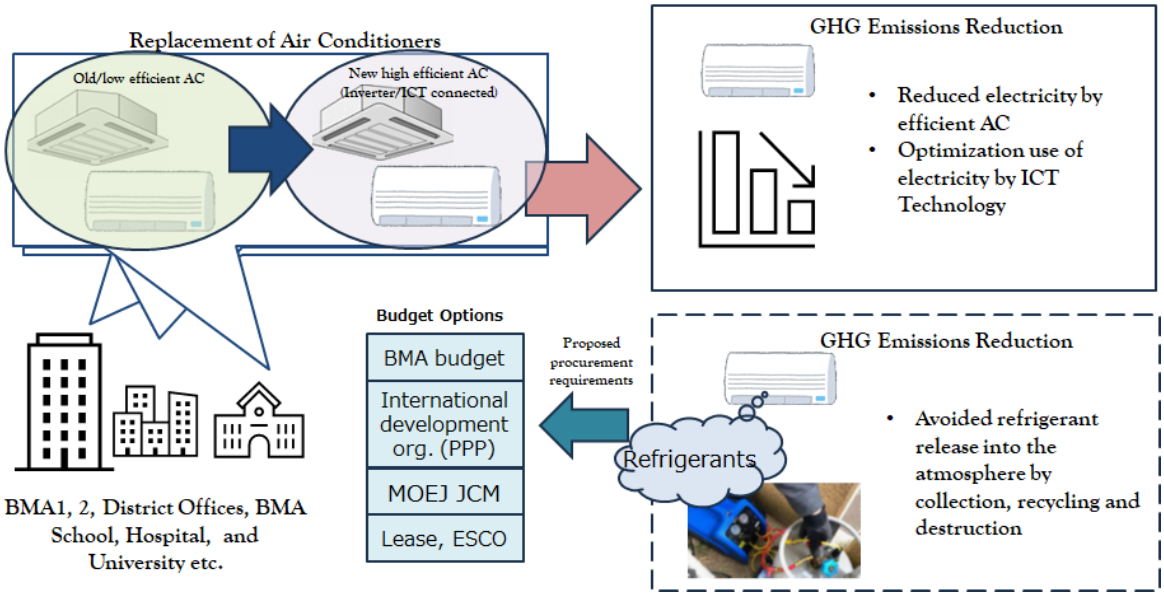


Table 10: Project idea of GHG emission reduction by renewale of HVAC and recovery of refrigerant at BMA facilities

The investigation was conducted with advice from the Office of Global Warming Countermeasures Division of the Ministry of the Environment.

Table 8: Activities this year for the proposed HVAC renewal and refrigerant recovery/destruction

project

Date	Outline
May to August, 2023	Preliminary Study with the BMA Climate Change Strategy Office and the Public Works Bureau
September, 2023	BMA officials participated in the Asia Group Training on Fluorocarbon Life Cycle Management (Bangkok), which was implemented by the Office of Fluorocarbon Control Policy, Ministry of the Environment, and a tour to used refrigerant destruction technology at Bangpoo Environmental Complex (BPEC).
September to October, 2023	BMA Public Works Administration Office Air Conditioning Control Inventory Summary Work
November 29, 2023	A project idea note (PIN) related to HFC recovery and destruction in conjunction with air conditioning equipment renewal was proposed in the consideration of the energy master plan at the BMA energy task force. Exchange of views on refrigerant recovery and destruction projects with BMA Governor, Environmental Policy Advisor, and Secretary of the Embassy of Japan
December 14, 2023	Exchange of views on energy conservation and refrigerant management in the study group/lease scheme on finance support in international organizations
January 3, 2024	Meeting with BMA Public Works Bureau, Air Conditioning Manufacturer and Local Energy Conservation Engineering Company
January 18, 2024	Proposed and agreed to the PIN at the BMA Governor-General's Meeting of the Yokohama City Director-General.
January 19, 2024	Detailed Survey by Local Energy Conservation Engineering Company Phase 1 (Identification of Equipment Required for Update and Collection of Information Required for Baseline)

In addition to the activities in the above table, information was collected on efforts by international organizations, etc., while cooperating. In particular, based on the Bangkok Metropolitan Climate Change Master Plan, the International Finance Corporation (IFC) is considering financing options for implementing the master plan using a policy tool called Advanced Practices for Environmental Excellence for Cities (APEX). JICA has also dispatched PPP experts to assist upstream in Bangkok's measures against climate change. BMA attaches importance to organic coordination between the formation of projects through the inter-city cooperation project and the consideration of financing options by IFC and JICA.

It is reported that BMA is interested in making more specific efforts in the future, especially in the project proposals for energy saving in air conditioning and recovery and destruction of used refrigerant.

In the latter half of this fiscal year, we started a survey with a local engineering company based on the air conditioning equipment management book collected by the BMA Public Works Bureau.

IV **Future plans**

Based on the results of this year's project and the status of activities in progress, activities to be implemented in the following fiscal year are described for each of the three pillars of this project. In the formulation and determination of the activity plan, consultation with the City of Yokohama, BMA, and other relevant organizations will be conducted.

(1) Promoting the Climate Change Master Plan

In fiscal year 2023, this project supported the formulation of the Energy Action Plan targeting the energy sector with the highest GHG emissions based on the "Bangkok Climate Change Master Plan," and the final draft was developed to be adopted. As soon as the plan is approved by the Steering Committee of BMA scheduled to meet in fiscal year 2024, it will be put through the BMA's internal approval process and is expected to be used in future budget applications for equipment upgrades by the Public Works Department and other agencies. In addition, in order to link the plan to specific capital investments and GHG reduction projects using decarbonization technologies, proposals to prepare Project Idea Notes (PINs) for the Energy Action Plan has been submitted, which already includes the above-mentioned BMA project to upgrade air conditioning equipment and others. Since these PINs will need to be updated as the implementation of the BMA's measures progresses, this City-to-city Coollaboration Project will use this as an entry point to propose continued project implementation to the BMA.

(2) Engaging the private sector

The "Workshop on Net Zero Emission Business Opportunity under Bangkok-Yokohama City to City Colloboration Project" has been held three times from FY2022 to FY2023. In particular, the third workshop held this year featured business pitches and business matching among Japanese and Thai companies, which resulted in active discussions among the participants. There were also cases where the workshops contributed to the formation of JCM projects, such as the "Solar Power Generation Project in Sri Lanka" listed in Table 5. We will continue to hold workshops, including business matches, to provide opportunities for continuous information exchange and relationship building between Japanese and Thai companies.

(3) Developing mitigation project

For the candidate projects identified in this year's survey, we will conduct additional surveys and preparation for application for the JCM Financing Programme in FY2024 or the following year in cooperation with the project stakeholders.

In FY2023, the adoption of JCM Financing Programme in Thailand was suspended due to circumstances on the part of the Thai government, but in FY2024, the process is likely to be resumed, and we will study the formation of projects while maintaining close communication with TGO and other JCM-related governmental organizations. In particular, since the timing of the restart of the process will affect the timing at which project participant can actually start ordering and installing equipment, it is necessary to examine candidate projects and provide support to project participant based on this point. In addition, as symbolized by the fact that solar power generation projects have been excluded from the JCM since the middle of FY2022, it is expected that the Thai government will further clarify its intentions regarding the fields and technologies that are eligible for the JCM.

V **Appendix**

Appendix 1 : Draft Energy Action Plan

Appendix 2 : Presentation materials of 3rd Workshop on Net Zero Emissions Business Opportunity under Bangkok Yokohama City to City Collaboration Programme: Session 1 presentations

Appendix 1 : Draft Energy Action Plan

(Draft) Bangkok Energy Action Plan 2024-2030

- The Bangkok-Bangkok Energy Action Plan 2024-2030 is in the draft stage and subject to change.
- This draft was created in Thai and was created by machine translation, so sufficient accuracy has not been ensured, so please refer to it.
- The description of the budget part is uncertain, so it is not displayed.
- The PIN is not attached because it was difficult to translate.
- Bangkok will conduct an internal review and once the content is finalized, it will be translated from Thai to English.

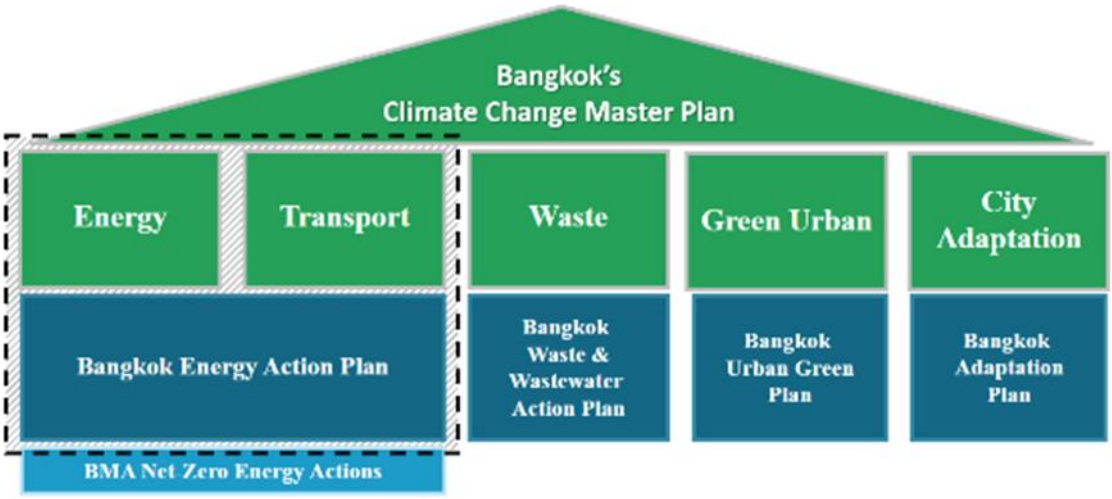
Table of contents

Bangkok Energy Action Plan 2024-2030

1. Introduction

Bangkok has set a target to reduce greenhouse gases according to the Bangkok Master Plan on Climate Change 2021 - 2030 at 19 percent by 2030, compared to greenhouse gas emissions in the case of no action. 2018 (Business As Usual: BAU) and long-term efforts to become a city that emits net zero greenhouse gas emissions (Net Zero Emissions) by 2050, of which the energy and transportation sectors are Important sectors that affect Bangkok's greenhouse gas emissions reduction goals. Therefore, activities and measures in clean energy and the clean transportation sector are important to drive Bangkok to achieve these goals. It is necessary to define measures and operations for both the procurement dimension and the user dimension within the framework of the roles and duties of Bangkok. To create and promote cooperation with government agencies, the private sector, and civil society.

The preparation of the Bangkok Energy Action Plan 2021~2030, which is consistent with the Bangkok Climate Change Master Plan 2021~2030 targets, will lead to the determination of measures and activities to reduce greenhouse gases in the energy and transportation sectors. All dimensions This is the framework for the implementation of Bangkok operations with maximum efficiency and effectiveness. It includes stakeholders who know and understand the role of government agencies in jointly advancing greenhouse gas reduction targets.



2. Bangkok Energy Action Plan 2021 ~ 2030 Targets

The Bangkok Energy Action Plan 2021 ~ 2030 was formulated with the main objective of converting the greenhouse gas reduction targets based on the Bangkok Climate Change Master Plan 2021 ~ 2030 into the energy and energy sectors.

This will enable Bangkok to efficiently achieve its greenhouse gas reduction targets within the specified year. By developing the Bangkok Energy Action Plan for the period 2021-2030, the key goals can be summarized as follows:

1. Set greenhouse gas reduction targets for the energy and transport sectors consistent with the measures specified in the Bangkok Climate Change Master Plan for 2021-2030.
2. Establish a framework and direction at the action plan level to specifically reduce greenhouse gases in Bangkok's energy and transport sectors.
3. To serve as a guideline for various agencies In Bangkok, operations are consistent or oriented in the same direction. It also includes helping to create continuity and sustainability.
4. Facilitating the participation process from relevant institutions under the control of the Bangkok Metropolitan Area, including the public, private and public sectors.

3. Relationship with Bangkok Climate Change Master Plan 2021 ~ 2030

3.1 Long-Term Climate Change Vision

Bangkok's Vision Bangkok Climate Change Master Plan 2021~2030 will be divided into two phases: Phase 1 within 2030 and Phase 2 within 2050. This is consistent with the timeline for implementing climate change in accordance with global and national guidelines. Bangkok's focus on achieving net-zero greenhouse gas emissions by 2050 is setting the direction for Bangkok's long-term operations. And it demonstrates and aligns with the C40 organization's commitment to promoting and supporting all major cities to become net-zero greenhouse gas emission cities.

Bangkok's Vision for Climate Change in 2030

"Bangkok is moving towards becoming a greener and livable city, ready to address climate change by collaborating across all sectors for sustainable development."

Bangkok's Vision for Climate Change in 2050

"Bangkok is a great place to live. We aim to achieve net-zero greenhouse gas emissions. Achieve sustainable innovation and are ready to embrace and adapt to change in all dimensions."

3.2 Greenhouse Gas Emissions Reduction Targets in the Energy and Transportation Sectors

The Bangkok Climate Change Master Plan 2021~2030 states that to achieve net zero emissions, three key measures must be considered: energy savings or switching to low-carbon energy, or zero carbon from fossil fuels; (decarbonized energy) and innovative measures including reducing emissions from outside Bangkok. All important measures are directly or indirectly related to the reduction of greenhouse gases in the energy and transport sectors.

With the setting of greenhouse gas reduction targets for the energy and transportation sectors based on the Bangkok Climate Change Master Plan 2021~2030, the greenhouse gas reduction targets are divided into two categories: targets at the national level and targets through city-level measures. (Bangkok) Greenhouse gas reduction targets for the national measures are calculated in proportion to the Bangkok region using the ratio of energy use between the Bangkok region and the country as a whole. Bangkok has set a 2030 greenhouse gas reduction target of 10.15 million tonnes of carbon dioxide equivalent (MtCO2e), which means that Bangkok will be able to reduce its greenhouse gas emissions by a total of approximately 13.15 million tonnes of carbon dioxide equivalent in 2030. The total greenhouse gas reduction target is 5.55 million tons of carbon dioxide equivalent by 2030, and the transportation sector has set a target of 4 million tons of carbon dioxide equivalent by 2030, as detailed in the table.

Table 1 Greenhouse Gas (GHG) Reduction/Absorption Targets by Region Compared to Greenhouse Gas Emissions

Unit: MtCO2e

sector	GHG emissions in base year FY 2018	GHG content in the case of BAU 2030	GHG Reduction and Absorption Targets 2030	GHG content after implementation of countermeasures
Energy	25.73	33.88	5.55	28.33
Transportation and Traffic	12.63	14.24	4.00	10.24
Waste & Wastewater Management	5.37	5.81	0.60	5.21
Total amount (GHG emissions)	43.73	53.93	10.15	43.78
Agriculture, Forestry and Land Use / Green Urban Planning	NE*	NE	0.01**	NE

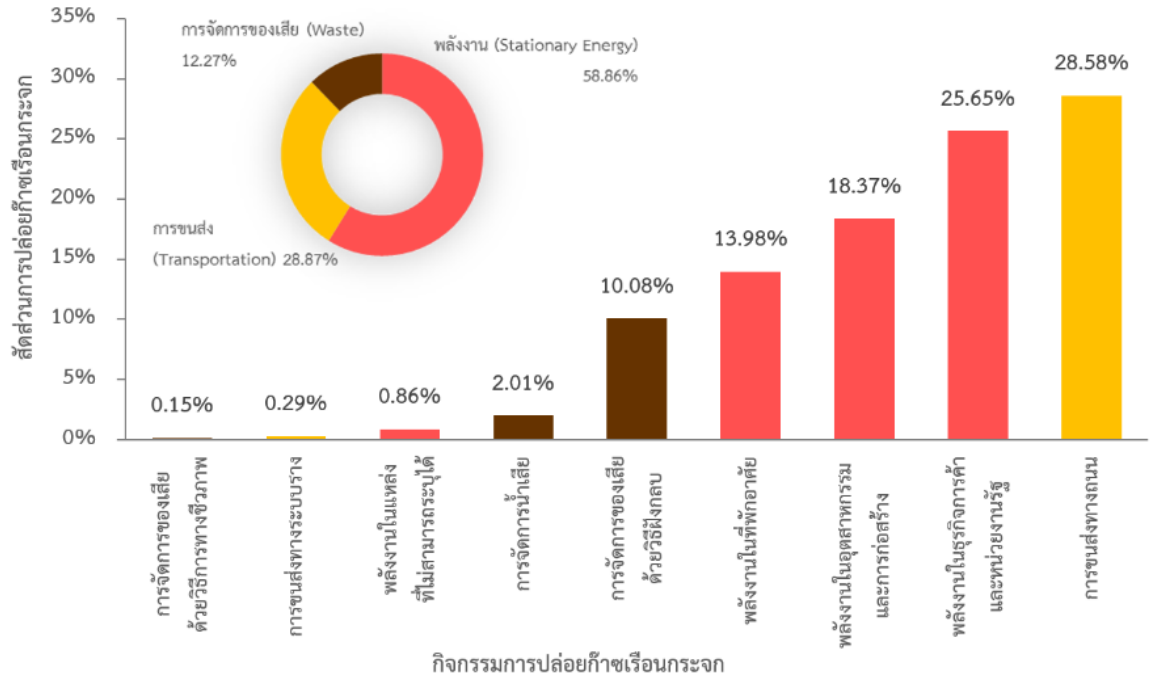
1. NE Unable to evaluate (No estimates)
2. NE*Greenhouse gas emissions in the agricultural sector have not been assessed. Forestry and land use (Afor)
3. ** It is calculated based on the amount of greenhouse gases absorbed by measures to increase green spaces in the Bangkok area.

3.3 Greenhouse Gas Emissions from the Energy and Transportation Sector in Bangkok

From Bangkok's greenhouse gas inventories As specified in the Bangkok Climate Change Master Plan 2021~2030, Bangkok's greenhouse gas emissions in 2018 (base year) were found to be equivalent to 43.73 million tons of carbon dioxide equivalent. The energy sector (steady-state energy) is the sector with the highest greenhouse gas emissions. It accounted for 58.86 percent of total greenhouse gas emissions, followed by the transportation sector (transportation) and the waste management sector (waste), with greenhouse gas emissions accounting for 28.87 percent and 12.27 percent of emissions.

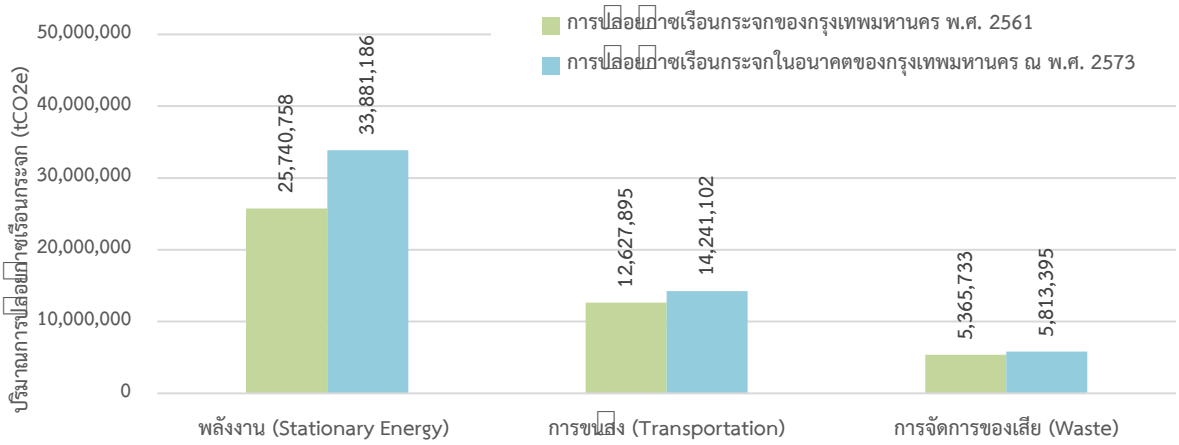
Considering the greenhouse gas emissions of all sub-activities, we found that the top five activities with the highest greenhouse gas emissions were 1) road transport, 2) commercial and government energy use, and 3) industrial energy use. 4) Residential energy use, 5) Local waste management through landfills. It accounts for 28.58 percent, 25.65 percent, 18.37 percent, 13.98 percent, and 10.08 percent of total greenhouse gas emissions, respectively, and the top five sub-activities mentioned above are This is equivalent to 96.66% of Bangkok's greenhouse gas emissions, which will be an important activity for Bangkok's greenhouse gas emission reduction efforts in the future. The details of greenhouse gas emissions from various activities are shown in Figure 2.

Figure 2: Percentage of greenhouse gas emissions in Bangkok in 2018 (base year)



In this regard, the forecast of greenhouse gas emissions from the base year (2018) to 2030 also shows that the sector with the highest greenhouse gas emissions accounted for 62.82% of the total amount of greenhouse gas emissions and will continue to increase in the future. By 2030, carbon dioxide equivalent will reach 33.88 million tonnes, followed by the transportation and waste management sectors. This will increase to 14.24 million and 5.81 million tonnes of carbon dioxide equivalent by 2030, accounting for 26.40 percent and 10.78 percent of total greenhouse gas emissions, respectively (see Figure 3). The energy and transportation sectors together account for 89.22% of Bangkok's greenhouse gas emissions. Therefore, it is a major sector that Bangkok should focus on in its greenhouse gas emission reduction activities.

Figure 3: Percentage of greenhouse gas emissions in Bangkok in 2018 (base year)

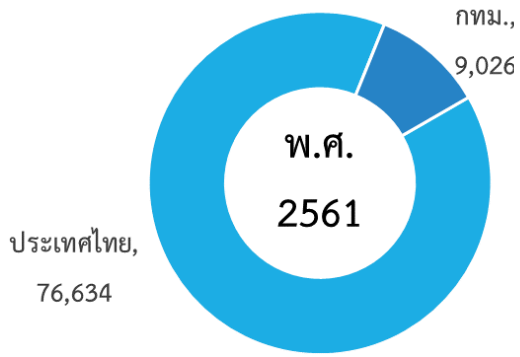


4. Energy and Fuel Usage in Bangkok's Energy and Transportation Sector

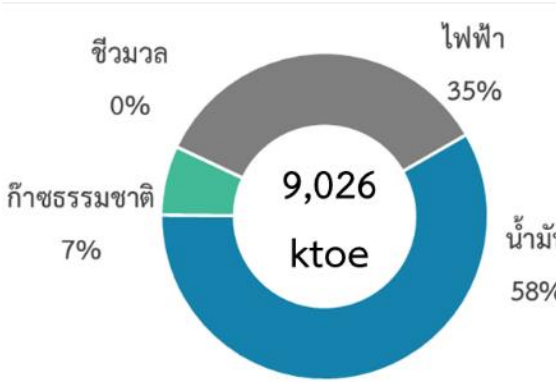
From Bangkok's greenhouse gas inventories As specified in the Bangkok Climate Change Master Plan 2021 ~ 2030, the final energy used in Bangkok consists of oil, electricity, natural gas, and biomass fuels, and Bangkok's final energy consumption in 2018 (base year) was 9,026 thousand tonnes of crude oil equivalent. This accounts for 11% of the country's final energy consumption.

Considering each fuel type, electricity accounts for 58% of total energy consumption, followed by electricity at 35%, natural gas at 7%, and biomass at 0.1% (Figure 4).

Figure 4: Bangkok's final energy use, 2018.



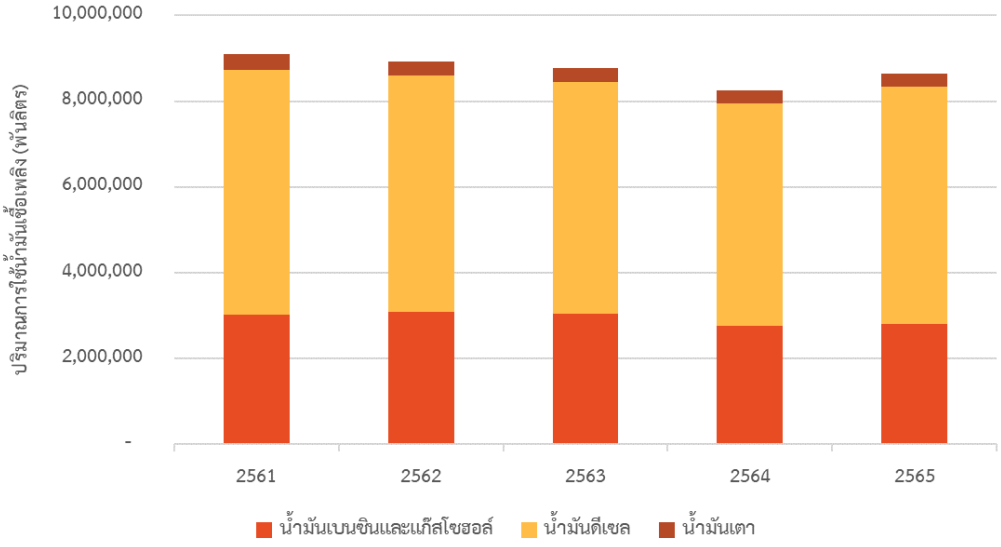
Bangkok's final percentage of energy consumption relative to the total country
: 1,000 tonnes of crude oil equivalent (KTOE)



BMA's Final Percentage of Energy Consumption by Fuel

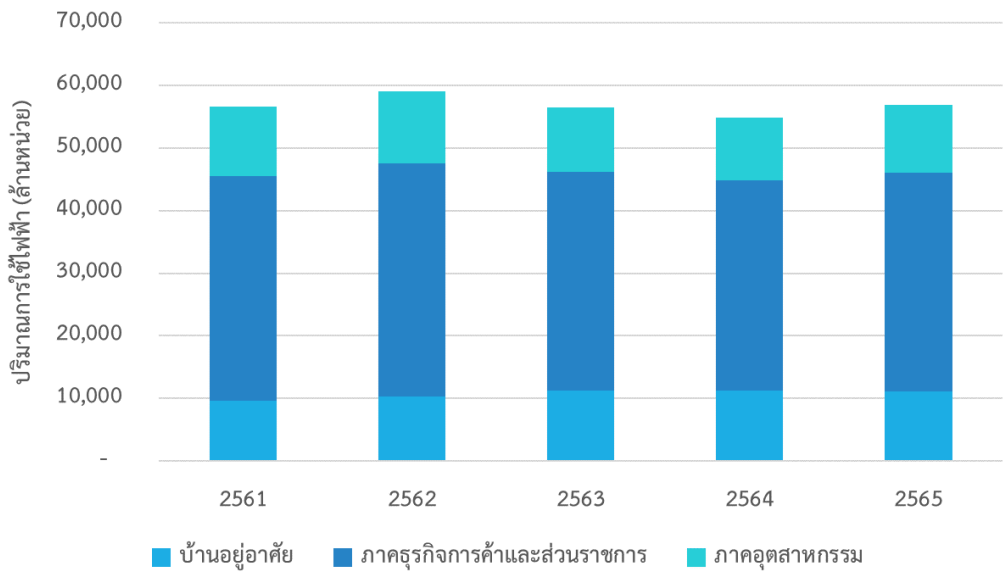
According to the Office of Home Statistics, fuel use in 2022 decreased by 5.1% compared to 2018 (see Figure 5) This is due to the fact that we are recovering from the pandemic and travel has decreased due to the continued work from home. There is also a growing shift from gasoline-powered vehicles to electric vehicles. The fuel with the largest share of application is diesel. This is followed by gasoline and gasohol. This is an oil used in the transport sector. Heavy oil is used as fuel in the industrial sector for a very small portion.

Figure 1: Fuel consumption in 2018-2022



For electricity usage from 2018 to 2022 (see Figure 6), it was found that electricity usage in 2022 increased by 0.46% per sector compared to 2018, with an increase in electricity usage including residential. Electricity usage in commercial businesses and government agencies increased by 14.8% from 2018. The industrial sector saw a slight decline of 2.15% and 3.53%, respectively.

Figure 6: Electricity consumption from 2018 to 2022


70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
ปริมาณการใช้ไฟฟ้า (ล้านหน่วย)
2561
2562
2563
2564
2565
บ้านอยู่อาศัย
ภาคธุรกิจการค้าและส่วนราชการ
ภาคอุตสาหกรรม

5. Guidelines for Reducing Greenhouse Gas Emissions in the Energy and Transportation Sectors

In general, guidelines can be implemented to reduce greenhouse gas emissions in the energy and transportation sectors. Start by reducing or avoiding unnecessary energy use. (Reduction/avoidance) Improving the efficiency of energy use by switching to high-efficiency equipment (improvement) or switching to other energy sources (shift). Specifically, it is as follows.

(1) Reduce or avoid unnecessary energy use (reduce/avoid), reduce energy usage without incurring investment costs. Focus on changing your behavior to avoid unnecessary energy use, such as turning off lights and air conditioning when not in use. Set the temperature of the air conditioner 1~2°C higher, avoid using a car when traveling short distances, etc.

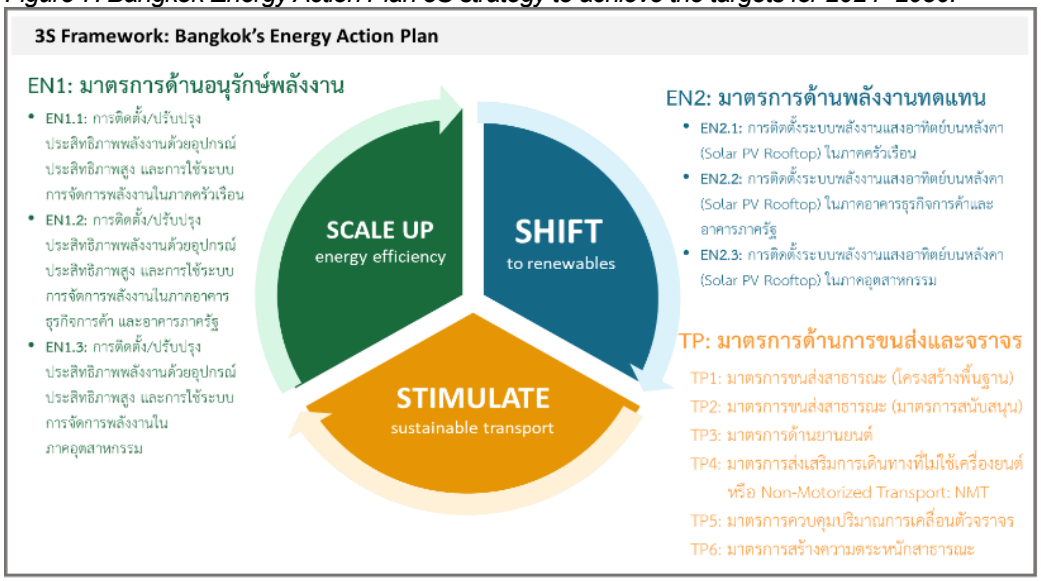
(2) Improvement of energy efficiency by switching to high-efficiency equipment (improvement) On average, energy consumption in the household sector accounts for about 71% of electricity consumption, air conditioning equipment accounts for about 19%, lighting accounts for about 8%, and other electricity consumption accounts for about 2%. Approximately 52% of electricity consumption is used for air conditioning equipment, 10% for lighting equipment, and 28% for other equipment, so we will improve energy efficiency by switching to high-efficiency equipment. It is especially noticeable in electric lighting and air conditioning systems. Energy consumption can be significantly reduced.

(3) Switching to other energies in the field of electrical energy. It will be a change to use renewable energy. In urban areas, the focus will be on power generation and fuel use from rooftop or rooftop solar power. We will use electrical energy instead of fuel.

6. Bangkok Energy Action Plan Key Strategies for 2024~2030

From the above guidelines on greenhouse gas reduction in the energy and transport sectors. Therefore, Bangkok has developed a strategy to reduce greenhouse gas emissions in the energy and transport sectors, namely the 3S framework. This is linked to measures to reduce greenhouse gas emissions in the energy and transport sectors, based on the Bangkok Climate Change Master Plan (EN1). EN2, TP1– TP6) (shown in Figure 7)

Figure 7. Bangkok Energy Action Plan 3S strategy to achieve the targets for 2024~2030.



Details are as follows

Strategy 1 Scaling up energy efficiency expands investment in energy conservation

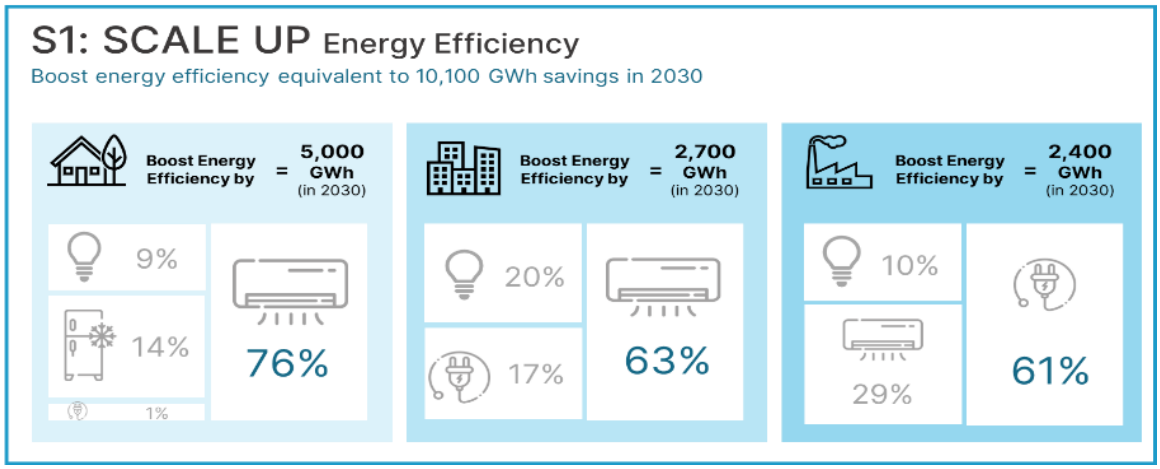
This is in line with the Energy Conservation Measures (EN1) of the Master Plan.
EN1.1: Installation / improvement of energy efficiency with high-efficiency appliances and implementation of energy management systems in the household sector
EN1.2: Installation/Improvement of Energy Efficiency with High-Efficiency Equipment and Implementation of Energy Management Systems in Commercial and Government Buildings
EN1.3: Installation / improvement of energy efficiency with high-efficiency equipment and implementation of energy management systems in the industrial sector

The main activities include improving the lighting system, using LED bulbs, using high-efficiency air conditioners, etc. The use of high-efficiency electric cooktops, centralized cooling systems and the use of high-efficiency equipment or machinery in the industrial sector.
The use of high-efficiency electric hobs, centralized cooling systems
An important goal has been set to improve energy efficiency that will lead to savings between 2024 and 2030.

Table 2 Strategy 1 Annual Targets Scaling up energy efficiency

measure	Annual Energy Saving Targets						
	2567	2568	2569	2570	2571	2572	2573
Energy-saving measures (EN1)	**1,050**	**2,069**	**3,162**	**4,193**	**6,188**	**8,201**	**10,112**
EN1.1: Household Sector	520	1,040	1,579	2,105	3,121	4,074	5,002
EN1.2: Commercial and Government Building Sector	278	557	853	1,138	1,670	2,139	2,675
EN1.3: Industrial Sector	251	472	730	950	1,397	1,987	2,436

Figure 2：Scaling up energy efficiency



Strategy 2 Shift to renewable energy

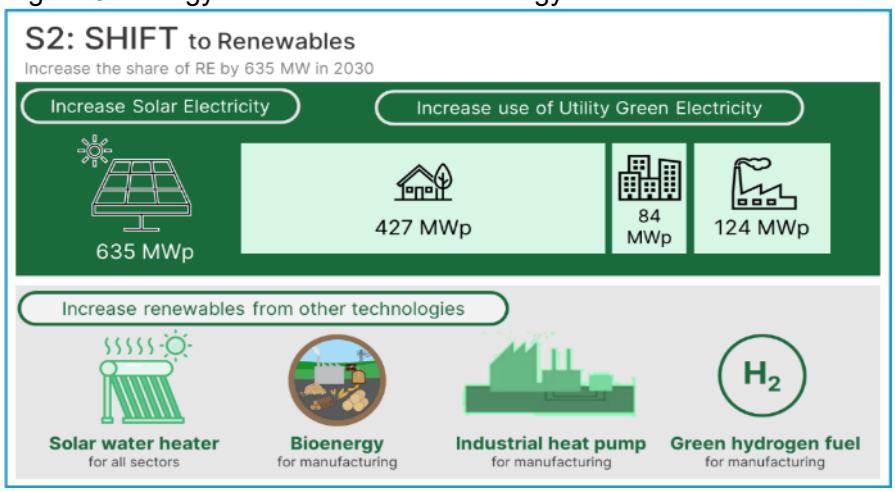
This is consistent with the Renewable Energy Measures (EN2) in the Master Plan and includes

the following sub-measures:
- EN2.1: Installation of solar energy systems on rooftops in the household sector (Solar PV Rooftop).
- EN2.2: Installation of solar energy systems on the rooftops of commercial and government buildings (photovoltaic rooftops).
- EN2.3: Installation of rooftop solar energy systems in the industrial sector (rooftop photovoltaic power generation).
Some of the main activities include: Rooftop photovoltaic installations Other activities such as the use of solar water heaters Promoting the use of bioenergy in the industrial sector Promote the use of heat pumps in industry.
For the future use of green hydrogen, an important target has been set to install 635 MW of rooftop solar power by 2024-2030, including 427 MW and 84 MW for residential and commercial use, and 124 MW for industrial use. Table 3 shows the annual targets.

Table 1 Strategic Annual Goals 2 Shift to renewable energy

measure	Annual installation target (MW) for rooftop solar power generation						
	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Renewable Energy Measures (EN2)	**60**	**120**	**200**	**280**	**370**	**518**	**635**
EN2.1: Household Sector	30	60	110	160	210	310	427
EN2.2: Commercial and Government Building Sector	10	20	30	40	60	84	84
EN2.3: Industrial Sector	20	40	60	80	100	124	124

Figure 3 strategy 2 Shift to renewable energy



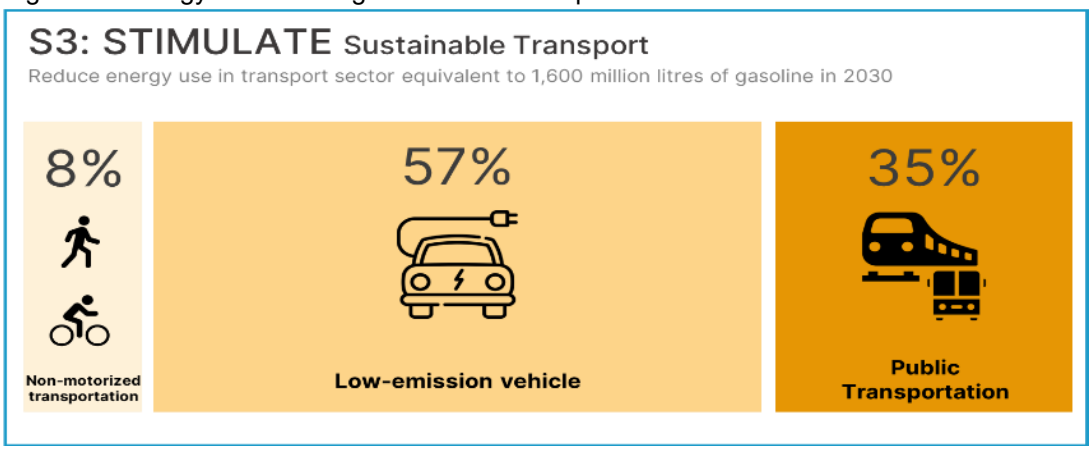
Strategy3 Promoting sustainable transport It promotes sustainable transportation.

This means that transport and traffic measures have the following sub-measures:
TP1: Public Transportation Policy (Infrastructure)
TP2: Measures for Public Transportation (Support Measures)
TP3: Automotive Measures
TP4: Measures to promote non-motorized transport (NMT)
The main activity is to promote the transition to public transport. Promotion of low-carbon vehicles and non-electric mobility (non-electric transportation)
Between 2024 and 2030, it has set an important target to stimulate sustainable transportation to reduce oil consumption by around 1.6 billion liters. The annual targets are shown in the table.

Table 2 :Strategy's annual goal 3: Promote sustainable transport

measure	Annual fuel consumption reduction target (million liters)						
	2024	2025	2026	2027	2028	2029	2030
Transportation Measures (TP)	160	321	481	641	962	1,283	1,603
TP1 & TP2: Public Transportation Measures	-	-	-	-	-	266	561
TP3: Automotive Measures	148	295	443	590	885	914	914
TP4: Measures to promote non-motorized transport (NMT)	13	26	38	51	77	103	128

Figure 4 Strategy 3: Promoting sustainable transportation

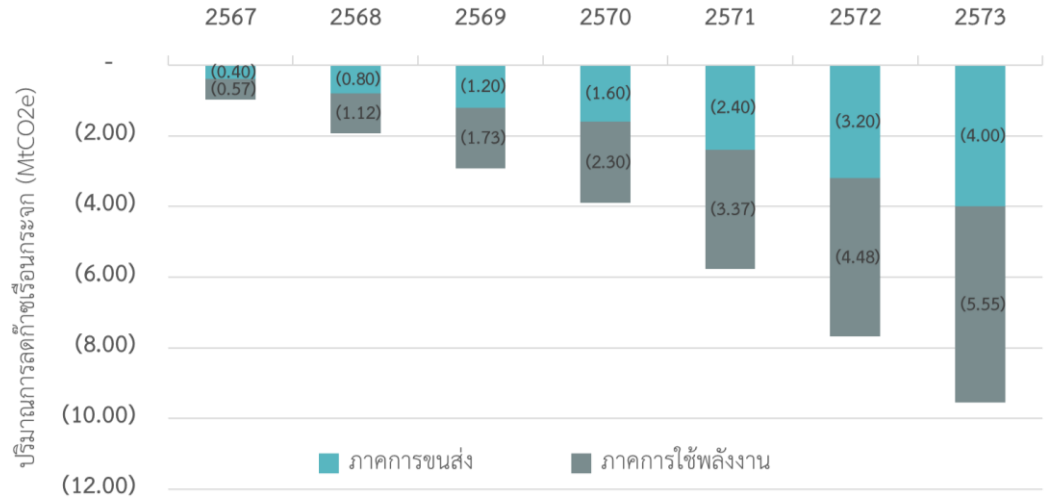


In summary, the expected results of implementing the 3S strategy above are shown in Table 5, which will lead to annual greenhouse gas reductions and help Bangkok achieve its targets, as shown in Figure 11. Emissions from the energy and transportation sectors in 2030 will be 5.55 million tonnes and 4 million tonnes of carbon dioxide equivalent, respectively.

Table 3 : Expected outcomes of the implementation of the 3S strategy

measure	Expected results (annual)						
	2024	2025	2026	2027	2028	2029	2030
Reduction of electricity consumption through energy-saving measures (million units)	1,050	2,069	3,162	4,193	6,188	8,201	10,112
Reduction rate of electricity consumption relative to electricity consumption in 2018 (base year)	2%	4%	6%	7%	11%	14%	18%
Expansion of rooftop solar power generation installed capacity (MW)	60	120	200	280	370	518	635
Solar power generation as a percentage of electricity consumption in 2018 (base year)	0.2%	0.3%	0.6%	0.8%	1.0%	1.4%	1.8%
Reduction of fuel consumption through sustainable transport measures (million liters)	160	321	481	641	962	1,283	1,603
Percentage reduction in oil consumption relative to oil consumption in 2018 (base year)	2%	4%	6%	7%	11%	15%	18%

Figure 5 Greenhouse gas reductions in Bangkok's energy and transport sectors in the implementation of the strategy. 3S



7. Key Measures of Bangkok Energy Action Plan 2024~2030

From targets and strategies to reduce greenhouse gases in the energy and transportation sectors. The Bangkok Energy Action Plan 2024-2030 is divided into two main groups of measures.

(1) A set of measures taken by Bangkok itself to reduce greenhouse gases in the energy and transport sectors arising from Bangkok's business activities.

(2) A set of measures taken by Bangkok to create an enabling environment for the household sector. Bangkok's commercial and industrial sectors are working to reduce greenhouse gases in the energy and transportation sectors.

7.1 A set of measures to reduce greenhouse gases in the energy and transport sectors arising from business activities in Bangkok.

Determine measures to reduce greenhouse gases in the energy and transport sectors arising from Bangkok's business activities. It starts with an assessment of the energy use activities in the operation in Bangkok. Specify guidelines for reducing greenhouse gases in the energy and transport sectors. Analyze problems and failures and specify solutions to resolve such problems. Determine the measures of Bangkok's Energy Action Plan. The details are as follows.

7.1.1 Greenhouse Gas Emissions Associated with Business Activities in the Energy and Transportation Sectors

In 2022, Bangkok's energy and transportation sector business activities emitted 277,078 tonnes of carbon dioxide equivalent.

(1) Electricity usage is equivalent to 345,335.396 kilowatt-hours (kWh), and greenhouse gas emissions from electricity use are equivalent to 172,633 tons (62.30%) of carbon dioxide equivalent. Of the total greenhouse gas emissions in Bangkok, greenhouse gas emissions from electricity use increased by 8.83% compared to 2018 (137,874 tons of carbon dioxide equivalent).

(2) Use of fuel in transportation The volumes of diesel, gasohol and natural gas used were 37,690,528 liters, 507,380 liters, and 6,338 kilograms, respectively, equivalent to greenhouse gas emissions of 103,295 tonnes, 1,136 tons, and 14.33 tons of carbon dioxide equivalent. Greenhouse Gas Emissions from Fuel Use in Transportation As shown in Figure 12 and Table 6, greenhouse gas emissions from the use of fuels in transportation increased by 6.60% compared to 2018 (111,823 t-CO2 equivalent).

Figure 6 Percentage of energy and transport sector greenhouse gas emissions from Bangkok operations (2023)

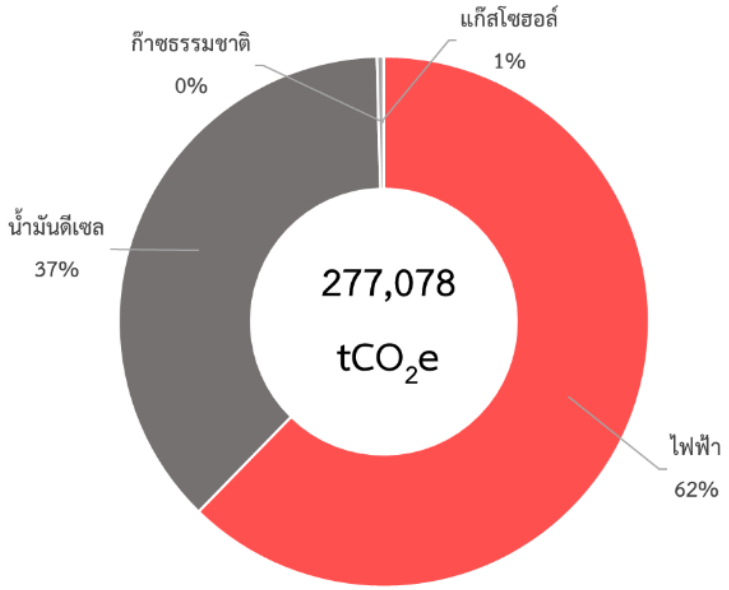


Table 4 Transportation Sector Energy and Fuel Consumption by Operations in Bangkok 2018 ~ 2022

Power Consumption	unit	2018	2019	2020	2021	2022
electricity	kWh	275,802,767	248,449,985	227,928,356	251,458,720	345,335,396
diesel oil	liter	39,844	38,602	39,372	37,523	37,690

		,379	,106	,184	,135	,528
Gas holes	liter	1,162,597	584,523	541,056	444,617	507,380
natural gas	kilogram	9,907	281	69,653	318	6338.19

7.1.2 Setting greenhouse gas reduction targets for the energy and transportation sectors by operating in Bangkok.

Greenhouse gas reduction targets for the entire energy and transportation sectors of Bangkok Province based on the 3S strategy can be allocated to Bangkok projects as shown in Table 7.

Table 5 Greenhouse Gas Reduction Targets for the Energy and Transportation Sectors in Bangkok

measure	Greenhouse Gas Reduction Targets for the Energy and Transportation Sectors through Various Measures						
	2024	2025	2026	2027	2028	2029	2030
Electricity consumption in Bangkok in 2018: 274.8 million units							
Reduction rate of electricity consumption relative to electricity consumption in 2018 (base year)	2%	4%	6%	7%	11%	14%	18%
Energy-saving measures (million units)	5.1	10.0	15.3	20.3	30.0	39.8	49.1
Reduction rate of electricity consumption relative to electricity consumption in 2018 (base year)	0.2%	0.3%	0.6%	0.8%	1.0%	1.4%	1.8%
Solar Rooftop Installation Measures (MW)	0.29	0.58	0.97	1.36	1.80	2.51	3.08
Fuel consumption of Bangkok operations in 2018: 39.4 million liters							
Percentage reduction in fuel consumption (excluding public transport) compared to oil consumption in 2018 (base year)	2%	4%	6%	7%	11%	12%	12%
Sustainable transport measures (million liters)	0.01	0.05	0.12	0.21	0.48	0.53	0.56

7.1.3 Problems and Obstacles in Reducing Greenhouse Gas Emissions in the Energy and Transportation Sectors from Operations in Bangkok, and Their Solutions.

The obstacles to greenhouse gas reduction activities in the energy and transportation sectors by operations in Bangkok can be divided into three aspects:

1) Limitations of funding sources Bangkok is a government agency, so the budget is quite limited. Combined with investment in retrofitting high-efficiency equipment, installing a rooftop solar system or switching to electric vehicles (EVs) requires significant investment. Therefore, it is necessary to build cooperation with the private sector. Or for international organizations to fill this financial gap.

2) Data Limits Renewable energy investments and energy efficiency improvements should be designed according to actual usage. Currently, such information is limited. Therefore, it is necessary to conduct research to gather information that will be used for both technical and financial evaluations.

3) Lack of knowledge and understanding Avoid unnecessary energy use (Avoid) focuses on changing behavior to avoid unnecessary energy use. This needs to be done in order to develop knowledge and understanding, as well as to conduct a campaign to raise awareness among Bangkok officials and officials.

7.1.4 Measures necessary to reduce greenhouse gases in the energy and transport sectors arising from Bangkok's business activities.

From greenhouse gas reduction targets in the energy and transportation sectors to guidelines for resolving the above problems and obstacles are included. As shown in Table 8, the measures needed to reduce greenhouse gases in the energy and transport sectors resulting from business activities in Bangkok can be identified.

Table 8: Measures required to reduce greenhouse gas emissions in the energy and transport sectors resulting from Bangkok's business activities.

measure	Sub-major
1.Energy-saving measures	1.1 PR Campaign: Build knowledge and understanding for Bangkok officials to change energy consumption behavior. 1.2 Detailed study of energy consumption data 1.3 Technical and financial feasibility study for high-efficiency equipment retrofit and energy management system construction 1.4 Introduction of high-performance equipment 1.5 Monitoring and Evaluation
2.Renewable Energy Measures	2.1 Technical and Financial Feasibility Study of Solar Rooftops in Bangkok Buildings 2.2 Solar Rooftop Installation in Bangkok Buildings 2.3 Monitoring and Evaluation
3.Transportation	3.1 Technical and financial feasibility study for the use of electric vehicles in Bangkok 3.2 Use of electric vehicles in Bangkok activities 3.3 Monitoring and Evaluation

7.2 A set of measures to create an enabling environment for the Household Sector Bangkok's Commerce and Industry Sector to Reduce Greenhouse Gases in Energy and Transportation Sectors

7.2.1 Environment Enabling the Household Sector Bangkok's commercial and industrial sectors to reduce greenhouse gases in energy and transportation sectors

To support the household sector Bangkok's commercial and industrial sectors to reduce greenhouse gases in the energy and transport sectors The government sector needs to develop an environment that allows the private sector to be developed, which is divided into five key aspects:

1) Infrastructure development, such as the development and maintenance of public transportation infrastructure such as public transportation and train systems. To reduce the use of private vehicles that produce pollution and greenhouse gases in Bangkok.

2) Create an environment that promotes access to financial resources, including by encouraging investment in environmentally sound projects. Support and create an environment that facilitates access to other capital, such as hosting events and seminars that connect entrepreneurs and investors.

3) Develop an environment that facilitates access to appropriate technologies, such as support for the development and use of environmentally friendly technologies. We will disseminate information on technologies to reduce greenhouse gas emissions. Promote innovation that helps reduce energy use

4) Strengthen the potential of human resources to meet the needs of the labour market, including the development of the knowledge and skills of workers in the energy and transport sectors. Assist with training and education to increase understanding of the use of environmentally friendly technologies and methods.

5) Campaigns to generate knowledge and understanding. Such as creating campaigns to raise public and corporate awareness about the environment and reducing energy use. Notification of news and dissemination of information on the reduction of greenhouse gases and changes in environmentally friendly behavior.

7.2.2 Measures Needed to Create an Environment Enabling the Household Sector Bangkok's Commerce and Industry Sector to Reduce Greenhouse Gases in Energy and Transportation Sectors

As discussed in section 7.2.1, the key measures and projects that must be implemented by the government to create an enabling environment for the household sector. As shown in Table 9, Bangkok's commercial and industrial sectors reduce greenhouse gases in the energy and transportation sectors.

Table 9: Key measures and projects that must be implemented by the government to create an enabling environment for the household sector. Commercial and Industrial Sectors to Reduce Greenhouse Gases in the Energy and Transportation Sectors

countermeasure	Sub-major	Important Projects
1.Energy conservation	1.1Initiatives to promote energy conservation in households 1.2Initiatives to Promote Energy Conservation in Business Divisions 1.3Measures to promote energy conservation in the industrial sector	1) Infrastructure development • The project provides passenger transportation services to the rail transport system by shuttle buses along various travel routes. • A project to improve the safety system of Bus Rapid Transit (BRT) lanes. • Bus Rapid Transit (BRT) Operation Project • Sidewalks and landscape improvement projects. It also includes the construction of pedestrian bridges in various areas. 2) Create an environment conducive to access to capital. • Consider the appropriate business model for developing each type of project. • Build a platform to develop private sector partnerships in energy and transport investments. • Create an environment conducive to financial innovation that supports investment in projects and technologies that help reduce greenhouse gases, such as carbon credits. • Helping financial institutions and financial institutions understand and support environmentally friendly projects. 3) Create an environment that promotes access to the right technology. • Building a platform to provide knowledge on renewable energy technologies. Energy efficiency improvement technology, etc. • Support R&D related to innovations and technologies suitable for reducing greenhouse gases. 4) Strengthening human resources to meet the needs of the labor market • Develop technical training courses for students, such as modifying a car to use electrical energy (EV conversion) at a vocational school in Bangkok. • Build a platform that links supply and demand in the labor market to reduce greenhouse gases in the energy and transport sectors. 5) Campaigns that generate knowledge and understanding • Campaigns to reduce greenhouse gases in the energy and transportation sectors, such as a campaign to turn off
2. Renewable Energy Efficiency	2.1 Measures to promote the installation of solar power generation roofs in homes 2.2 Measures to promote the installation of solar power generation on rooftops in the commercial sector 2.3 Measures to promote the installation of solar power generation on rooftops in the industrial sector	
3. Means of transport	3.1. Rooftop installation of solar power generation, technical and economic feasibility study of the use of electric vehicles in Bangkok 3.2. Use of Electric Vehicles in Activities in Bangkok 3.3. Monitoring and Evaluation	

countermeasure	Sub-major	Important Projects
		lights for one hour to prevent global warming. Set the temperature of the air conditioner to 1 degree higher. • Disseminate knowledge of greenhouse gas reduction in the energy and transportation sectors to students. • Disseminate knowledge of greenhouse gas reduction in the energy and transport sectors to the general public.

From the framework described in this chapter it is further developed into the Bangkok Energy Action Plan in Chapter 8

8. Bangkok Energy Action Plan 2024 – 2030

8.1 Operational phases of the development plan and implementation of the action plan.

The implementation phase can be divided into three phases, consistent with the implementation of the Bangkok Climate Change Master Plan:

1) Phase 1 (2023~2024) is the preparation period. Both in terms of the establishment or addition of duties and roles to the work group. and existing network partners The first phase, which involves the setting of targets and indicators at the government level of the Bangkok Metropolitan Government, allows the parallel development of ideas and possible projects in the energy and transport sectors to begin. First, define a zone or pilot area. or build cooperation with network partners according to the Bangkok Roles and Responsibilities Framework It is also the stage of preparing knowledge and understanding so that it leads to an understanding of all stakeholders and leads to actions that are consistent with the goals of the Action Plan. Specifically, including considering the challenges and limitations in the implementation of the action plan. Develop and discuss plans with relevant agencies to jointly promote action plans. Effectively

2) Phase 2 (2025~2027) is the implementation of the action plan. Bangkok's main role is to strengthen network partners and follow up on the progress of various activities and projects. It also reviews opportunities and challenges, including development gaps. In order to promote and support various projects, to be able to operate efficiently, It is also a phase of expanding the results of project management that started in projects and pilot areas in other regions. in Bangkok

3) In Phase 3 (2028~2030), the business of various sectors will be promoted. In order to continuously reduce greenhouse gases, projects and measures can be monitored and evaluated by considering the actual and amount of greenhouse gas reductions.

8.2 Bangkok Energy Action Plan 2024 ~ 2030

Significant measures and activities to reduce greenhouse gases in the energy and transport sectors arising from Bangkok's business activities.

8.2.1 Energy Aspects

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
EN1: Energy Conservation Measures	EN 1.1 Installation / Improvement of Energy Efficiency with High-Efficiency Equipment and Implementation of Energy Management Systems in the Household Sector	Organize activities to promote the purchase of energy-saving electrical equipment for use in residential use.	Department of Social Development	N/A	2023-2030	-
		Promote knowledge and understanding of air conditioning maintenance for energy saving.	Department of Social Development	N/A	2023-2030	-
	EN 1.2 Installation / Improvement of Energy Efficiency with High-Efficiency Equipment and Implementation of Energy Management Systems in Commercial and Government Buildings	Adoption of high-performance fans (net heat exchangers) (buildings and structures in Bangkok)	Department of Public Works	N/A	2023-2030	-
		Use of Combined Energy Production System (Cogeneration System) (Buildings and Structures in Bangkok)	Department of Public Works	N/A	2023-2030	-
		We will promote energy-saving activities. (Publication of Cost-Effectiveness Information, etc.)	Department of Public Works	N/A	2023-2030	
		Commendation for energy-saving activities	Department of Public Works	N/A	2023-2030	
		Prepare a systematic schedule of Koku building renovation works for proper energy management.	Department of Public Works	N/A	2023-2030	
		We will carry out planned renovation and renovation work for the purpose of saving energy in buildings in Bangkok	Department of Public Works	N/A	2023-2030	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
		Select a prototype project for energy-saving renovation work by applying the most efficient appliance case.	Department of Public Works	N/A	2023-2030	
		It sets energy-saving requirements for building renovations in Bangkok and sets high energy efficiency standards. Improvement to obtain energy-saving certification (CASBEE, LEED, etc.)	Department of Public Works Department of Urban Planning and Development	Not applicable	2016-2023	
		Retrofit work is being considered. Expansion work to support future use when the facility is fully operational.	Department of Public Works		2021-2030	
		Utilizing the knowledge and experience of private companies to improve operations for efficient energy conservation	Strategic Evaluation Office		2021-2030	
		Improve windows to prevent heat. (Use glass that prevents high heat, such as low-radiation glass or low-e glass.))	Department of Public Works		2021-2030	
		Introduced a system to reuse rainwater	Department of Public Works		2021-2030	
		Utilizing Building Energy (BEMS) Building Energy Management System	Department of Public Works		2021-2030	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
		Changing street lights to LED	Department of Public Works Department of Transportation		2021-2030	
		Require the construction of new buildings in Bangkok to meet energy certification assessment requirements (e.g., CASBEE and LEED)	Department of Public Works		2021-2030	
		Hold a discussion on energy conservation to demonstrate Bangkok's energy-saving capabilities or display it on a screen	Department of the Environment		2021-2030	
		Energy-saving renovation meetings will be held with the participation of the general public, including school children.	Department of the Environment		2021-2030	
		Define low-carbon prototype areas using top-runner indicators (compared to the best-achieved samples) and fully invest in low-carbon equipment	Department of the Environment		2021-2030	
		Green Office Project Activities: Promotion of economical energy reduction measures and promotion of environmentally friendly offices	Department of the Environment	[redacted]	2023	Strategy 2: Sustainable Environmental Development and Climate Change (Strategy 2.1)
		Project for Promoting Energy Efficiency in Buildings Controlled by Bangkok City Activities:	Department of the Environment	[redacted]	2023	Strategy 2: Sustainable Environmental

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
		Organize training for staff in Bangkok Energy Conservation in Controlled Buildings - Follow up and evaluate energy savings results in controlled buildings				Development and Climate Change (Sub-Strategy 2.4)
		Energy Reduction Project at Bangkok Government Building	All Departments	[redacted]	2023	
		Survey and preparation of a plan for the introduction of energy-saving and renewable energy systems for buildings in Bangkok (consultant proposal)	-	[redacted]		
		(200076) Training and upgrading of personnel in Bangkok who will become experts in assessing the design, construction, or modification of buildings for energy conservation.	SNC	[redacted]	2024	Strategy 2: Sustainable Environmental Development and Climate Change
		(200077) Bangkok Ministries and Agencies Promoting Energy Conservation Development	SSL	[redacted]	2024	
		(200078) Energy-saving human resource development project	SSL	[redacted]	2024	
		(200082) Energy Conservation Project at Bangkok Government Building	SSL	[redacted]	2024	
	EN 1.3 Installation/Improvement of Energy Efficiency with High-Efficiency Equipment and Implementation of Industrial Energy Management Systems	Organization of activities to disseminate energy-saving technologies in factories (for small and medium-sized enterprises)	Department of Public Works		2023-2030	
		Commendation for energy-saving activities	Department of Public Works		2023-2030	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
EN2: Renewable Energy Measures	EN 2.1 Installation of Household Photovoltaic Rooftop Systems	Promoting the installation of solar energy systems on rooftops	Department of Public Works		2019-2030	
	EN 2.2 Photovoltaic Rooftop Installation in Commercial and Government Buildings	Installation of rooftop photovoltaic systems in buildings and structures in Bangkok	Department of Public Works		2019-2030	
		(200073) Installation of rooftop solar power in civil engineering office buildings and drainage office buildings		[redacted]	2024	Strategy 2: Sustainable Environmental Development and Climate Change
		(200075) Consideration and preparation of a plan for the introduction of energy-saving and renewable energy systems for buildings in Bangkok (2023-2070 consecutive years, budget 60.241 million baht)	NIF	[redacted]	2024	
		(200079) Renewable Energy Power Generation Promotion Project for Medical Bureau Hospitals, Bangkok: 10 locations	Medical Affairs Bureau	[redacted]	2024	
	EN2.3 Installation of photovoltaic rooftop systems in the industrial	Promoting the installation of solar energy systems on rooftops	Department of Public		2019-2030	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
	sector		Works			
Additional measures	-	Development of an energy reporting system for the Bangkok Authority Activities: - Develop an Energy Use Data Reporting System (SYP.). - Briefing session on the energy use data reporting system development project for Bangkok government agencies	Department of the Environment	[redacted]	2023	Strategy 2: Sustainable Environmental Development and Climate Change (Sub-Strategy 2.4)
	-	Study and installation of RFID system on vehicles of Bangkok Authority (Bangkok) (Proposal by consultants)		[redacted]	2023	
	-	(200066) Lights-out campaign for one hour to prevent global warming	Department of the Environment	[redacted]	2024	Strategy 2: Sustainable Environmental Development and Climate Change
	-	(200080) Solid waste treatment business fueled by the separation of organic matter into a biogas fermentation processGenerate electricity and manage the On Nut Solid Waste Disposal Center, a waste and community waste management learning center.	SSL	[redacted]	2024	
	-	(200070) Projects to monitor the success of projects under the Bangkok Climate Change Master Plan 2021-2030			2024	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main Administrative Offices	Budget /Project Status	Duration of execution	Bangkok Government Action Plan
Countermeasures Groups	Submeasure Groups					
	-	(200071) The Bangkok 2 Building Project aims to reduce greenhouse gas emissions to net-zero by 2026.			2024	

8.2.2 Transportation

Bangkok's Climate Change Master Plan (2021 - 2030)		**project**	**Main duties of the bureau**	**Budget/ Project Status**	**period execute**	**Bangkok Government Action Plan**
Main Countermeasures Groups	**Submeasure Groups**					
TP1: Public Transportation Measures (Infrastructure)	TP1.1 Development of Rail Transportation System	Extension of BTS Green Line, Sukhumvit Line and Silom Line	Department of Transportation	[redacted]	2021-2029	Strategy 4: Connecting Cities with Mobility and Integrated Public Service Systems (Substrategy 4.4)
		Develop a public transportation system using the monorail (gray line) Wacharapole-Thonglor route. and Phra Khanong - Thapra Route. Total distance39.91km	Department of Transportation	[redacted]	2023-2029	
		Develop public transportation using the light rail transportation system, Bangna-Suvarnabhumi Airport Line, distance 18.30 km	Department of Transportation	[redacted]	2023-2024	
		Expand the service of the Gold Line train. (Krung Thong Buri ~ Klong Sarn Line) Extension added to Klong Xang ~ Prajadipok Line	Department of Transportation	[redacted]	2024	
	TP1.2 Development of Water Transportation System	Seng Sep Canal Navigation Project, Extension (Wat Si Vung Luang Pier - Minburi District Office Pier), 10.50 km distance, developed the use of electric boats for navigation in the canal and navigation in the canal	Department of Transportation	[redacted]	2020-2025	Strategy 4: Connecting Cities with Mobility and Integrated Public Service

Bangkok's Climate Change Master Plan (2021 - 30)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
		Electric Navigation System Development Project, Khlong Padung Krung Kasem Route, Phase 2 (Hua Lamphong Station Pier - Thewarat Market Pier), Distance 5 km	Department of Transportation	[redacted]	2023-2027	Systems (Substrategy 4.4)
		Improving ports with safety systems. It also includes the use of photovoltaic systems for lighting Maintenance and repair of 11 piers at Klong Padung Krung Kasem Maintenance and repair of Fasi Charoen Canal Pier 24	Department of Transportation	[redacted]	2024	
		Construction and improvement of piers to facilitate navigation of the canal. (1) Rajini Wharf Construction Project in Phra Nakhon Province (Soitakham) (2) Nawamin University Pier Construction Project in Dusit District (3) Ncep Canal Pier Expansion Project (4) Construction project of Phra Khanong Canal and Prawet Brirom Canal Pier	Department of Transportation	[redacted]	2024	
		(5) Bangkok-Yai Canal Pier Construction Project (6) Banramp – Canal Pier Construction Project	Department of Transportation	[redacted]	2025	
TP2: Measures for Public Transportatio	TP2.1 Advances in Public Transport Connectivity	Bus Expressway (BRT) route development project between Chong Nonsi ~ Ratchapruek using electric energy buses (EVs).	Department of Transportation	[redacted]	2024-2029	Strategy 4: Connecting Cities with Mobility and

Bangkok's Climate Change Master Plan (2021 - 30)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
n (Support Measures)		A project that provides services for transporting passengers to major mass transit systems. Bangkok Region Secondary Transportation System (BMA Feeder) by Route, 2025 ~ 2028	Department of Transportation	[redacted]	2025-2028	Integrated Public Service Systems
	TP2.2 Bus Parking Improvements	Installation of single-row bus stops with electric lights: 100 points (150 points)	Department of Transportation	[redacted]	2025	Strategy 4: Connecting Cities with Mobility and Integrated Public Service Systems (Substrategy 4.4)
		Development of Intelligent Bus Passenger Accommodation Pavilion (Arrival Time Estimation System: ETA) and Development of Solar-Powered Passenger Accommodation Pavilion North Bangkok Group's construction of 20 bus passenger accommodation pavilions. Construction of 9 Bangkok Eastern Bus Passenger Accommodation Buildings. Bangkok Central Group's 22 bus passenger accommodation pavilions were constructed. Construction of 7 bus passenger accommodation pavilions of the Southern Krung Thong Group. Construction of 21 Southern Bangkok Group Bus Passenger Accommodation Pavilions. Construction of 10 Bus Passenger Accommodation Pavilions for Krung Thong Nuea Group	Department of Transportation	[redacted]	2024	
		Construction of a new type of bus passenger accommodation pavilion Thonburi side Construction of a new type of bus	Department of Transportation	[redacted]	2025	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
		accommodation pavilion. Phra Nakhon side, 60				
	TP2.3 Park & Ride Development	Mo Chit Bus Station Park & Ride Improvement Project	Department of Transportation	[redacted]	2025	Strategy 4: Connecting Cities with Mobility and Integrated Public Service Systems
		Building cooperation with metropolitan areas in providing park-and-ride spots	Department of Transportation	[redacted]	2024-2030	
		Publicizing private sector stop-and-go spots at mass transit intervals, etc.	Department of Transportation	[redacted]	2024-2030	
	TP2.4 Development of a shuttle bus system that connects transportation and railways	Din Daeng Route - BTS Project BTS to provide passenger transportation services to the rail transportation system by shuttle bus between Sanam Pao	Department of Transportation	[redacted]	2022-2024	Strategy 4: Connecting Cities with Mobility and Integrated Public Service Systems
		Shuttle Bus, Romklao Residential Community Route - ARL Project to provide services to transport passengers to the rail transport system in Lackabang	Department of Transportation	[redacted]	2022-2024	
		Transportation of passengers to the rail transportation system by shuttle bus routes in Bangkok	Department of Transportation		2024-2026	
TP3: Automotive Measures	TP3.1 Replacing Public BusesTaxis and microbuses use low-emission vehicles (LEV).	A project to install and service an electric charging station (EV Charging Station) in Bangkok to support the construction of an electric vehicle ecosystem	Department of Transportation	-	2024-2030	Strategy 2: Sustainable Environmental Development and Climate Change (Sub-

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
						Strategy 2.4)
	TP3.2 Replacement of Delivery Motorcycle with Electric Motorcycle	A project to install an electric motorcycle battery swapping station (motorcycle battery swapping station) near BTS stations to support the construction of an electric vehicle ecosystem	Department of Transportation		2024-2030	
	TP3.3 Use of Low Emission Vehicles (LEVs) within Bangkok Authorities	Project to convert 500 government vehicles into modified electric vehicles	Ministry of Finance	[redacted]	2025	
		Electric tricycle rental project to collect solid waste with a payload capacity of more than 500 kilograms. 50 units	Department of the Environment	[redacted]	2023-2028	
		2-ton electric compressed garbage truck leasing business	Department of the Environment	[redacted]	2025-2030	
		5-ton electric compressed garbage truck leasing business	Department of the Environment	[redacted]	2025-2030	
TP4: Measures to promote non-motorized transport (NMT)	TP4.1 Sidewalk development in Bangkok and its suburbs	A project to develop a Skywalk elevated walkway connecting the Skywalk elevated walkway between Udomsuk Station ~ Bangna Station and the sidewalk from Teldotai Road. Thaksin - Pekkasem Pier facilitates public transport connections	Department of Transportation		2024-2030	Strategy 4: Connecting Cities with Mobility and Integrated Public Service Systems (Substrategy 4.4)
		Details about King Taksin Bridge Renovation Design Project and Cost Estimation BTS Saphan Taksin Station (S6)	Department of Transportation	[redacted]	2025-2026	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
		Construction of an elevated walkway (skywalk) connecting Surasak Station (S5) to the pedestrian bridge in front of Bangkok Christian School.	Department of Transportation	[redacted]	2025-2026	
		Construction of a roof covering the sidewalk connecting the Bangkok Mass Transit System, Mo Chit Station and the MRT Charam Ratchamongkol Line (Chatuchak Park side)	Department of Transportation	[redacted]	2025	
		Construction of a roof covering the walkway connecting Phetchaburi MRT Station and Asoke Pier	Department of Transportation	[redacted]	2025	
		Construction of a skywalk along Rajaviti Street from the Victory Monument to the Victory Building intersection	Department of Public Works	[redacted]	2025-2026	
		Construction of a roof covering the sidewalk on Phayathai Road BTS Ratchathewi Station to Pathumwan Intersection, from Henri Dunant Road to Rama I Road to Chulalongkorn University	Department of Public Works	[redacted]	2025	
		Construction of a roof covering the sidewalk from Rama IV Road, Sam Yan intersection to Sala Daeng intersection	Department of Public Works	[redacted]	2025	
		Construction of a roof covering the sidewalk of Ratchadamri Street from Ratchaprasong intersection to Sala Daeng intersection	Department of Public Works	[redacted]	2025	
		Construction of a roof covering the sidewalk on Phaya Thai Road between BTS Victory Monument	Department of Public	[redacted]	2025	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
		Station and BTS Phaya Thai Station	Works			
		Sidewalk and sidewalk development projects in Bangkok and its suburbs	Department of Public Works/District Office		2024-2030	
	TP4.2 Bicycle Path Improvements	Promote the use of public transport and increase transportation options. Use a bicycle to connect to public transport. To help the private sector open up space for bike-sharing services.	Department of Transportation	[redacted]	2024-2025	
		Bangkok Master Plan Project: Pedestrian and Bicycle Commuter City Connecting Inclusive and Sustainable Public Transport	Department of Transportation	[redacted]	2024	Strategy 2: Sustainable Environmental Development and Climate Change
		This design will renovate the area and create a bicycle district to facilitate traffic on foot. Bicycle and public transport connections	Department of Transport /Department of Public Works/District Office		2024-2030	
		Buy ready-made movable bicycle parking 1,000 sets for 5 units	Department of Transportation	[redacted]	2025	
		Buy ready-made movable bicycle parking 500 sets for 10 units	Department of Transportation	[redacted]	2025	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
TP5: Traffic Movement Control Measures	TP5.1 Road Network Construction and Development	The construction project connecting the main roads is a road network that Bangkok is in charge of	Department of Public Works		2024-2030	
		By building and developing the road network, improving the mobility of travel, and physical coordination such as bottlenecks. U-turn points, openings, etc.	Department of Public Works		2024-2030	
		Construction of a bridge over the Chao Phraya River Potential for increased mobility Construction plan of the bridge over the Chao Phraya River Kiac Khai Crossing, Phase 2: Construction of the bridge over the Chao Phraya River. A project to employ consultants for the development of community centers in the suburbs of Taling Chan and adjacent areas.	Department of Public Works/Department of Urban Planning and Development		2024-2030	
	TP5.2 Improvement of Traffic Signal System	50 Installation of traffic light control systems at intersections	Department of Transportation	[redacted]	2024	
		Installation of adaptive traffic light control systems at 100 intersections	Department of Transportation	[redacted]	2025	
		Expansion of the installation area of adaptive time-controlled traffic lights Traffic system management technology using Area Traffic Control (ATC)	Department of Transportation	-	2025	

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
		Buy Micro Traffic Simulation Software	Department of Transportation	-	2025	
TP6: Measures to Raise Public Information	TP6.1 Promoting the Use of Public Transportation	Campaigns to promote the use of public transport. Provision of BMA Feeder Electric Vehicles to Pick Up and Drop Off People During Festivals and Holidays Transportation of people traveling to attend the annual Red Cross event. National Stadium ~ Lumpini Park Route (Gate 1) Pick up and drop off at the junction of the route connecting BTS Bang Khunnon Station to 4 floating markets in Taling Chan District Transfers are connected to the people of BTS Bang Kung Nong Station and the route between the four floating markets in Taling Chan district.	Department of Transportation	[redacted]	2024-2030	
	TP6.2 Education on Environmentally Friendly Transportation and Transportation Systems	Campaign on Environmentally Friendly Transportation and Transportation Systems in Schools (Primary and Secondary Education) in Bangkok	Department of Transport / Department of Education			
		Teaching materials for creating educational materials such as manga	Department of Transport / Department of the Environment			

Bangkok's Climate Change Master Plan (2021 - 2030)		project	Main duties of the bureau	Budget/ Project Status	period execute	Bangkok Government Action Plan
Main Countermeasures Groups	Submeasure Groups					
			Department of Education			
		(200019) Low Emission Zone Promotion Project	Department of the Environment		2024-2030	
		In collaboration with King Mongkut's University of Technology Thonburi, we are developing a training curriculum for vehicle conversion to harness electrical energy at a vocational school in Bangkok	Department of Social Development	[redacted]	2024	
		Educational activities of the electric engine course	Department of Social Development	[redacted]	2024-2030	
		Modified Electric Vehicle (EV Conversion) Basic Training Business	Ministry of Finance	[redacted]	2025	

9. Monitoring and Evaluation

9.1 How Monitoring and Evaluation Works

The monitoring and assessment of the Bangkok Energy Action Plan 2024 ~ 2030 will use the monitoring and assessment guidelines specified in the Bangkok Climate Change Master Plan 2021 ~ 2030 to ensure consistency of the data collected. It is carried out according to the PDCA cycle (Plan-Do-Check-Act) of Plan, Do, Check, and Implementation of improvement and development (Act). Improve and develop action plans. Keep getting better and more relevant. It is monitored and evaluated annually because the Bangkok Energy Action Plan 2024~2030 is a short-term plan. Therefore, close monitoring and evaluation should be carried out regularly. The results are then used to review the overall performance annually.

This monitoring and assessment structure will be part of the institutional and administrative structures that Bangkok has established to support the implementation of the Climate Change Master Plan. As the agency responsible for environmental management in Bangkok, the Department of Environment is responsible for coordinating the implementation of the plan. There are also bureau-level agencies in charge of each area. The work structure, which includes external experts to drive Bangkok's environmental management policies, will consist of:

1) The Director General of the Environment is the Climate Change Strategy Sub-Unit (CCS) of the Air Quality and Noise Management Division.

2) There are 5 departments in charge of different levels of work groups. (Task Force: TF), namely the areas that promote the sustainable and environmentally friendly transport sector, the energy efficiency and alternative energy sector, the efficient waste management and wastewater treatment sector, the green urban planning sector, and the adaptation sector to address climate change

3) The working group will promote the implementation of the master plan.

4) Project Steering Committee (Steering Committee: SC)

5) The committee to oversee the implementation of the master plan.

9.2 Indicators for monitoring and evaluating the Action Plan

Bangkok Energy Action Plan has created annual targets for each strategy to monitor and evaluate greenhouse gas reduction results for 2024~2030. Achieve Bangkok's greenhouse gas reduction targets from the energy and transportation sectors. Tables 10 and 11 show.

Table 10 Annual Greenhouse Gas Reduction Targets for the 3S Strategy Based on Bangkok's Targets (Electricity and Energy Consumption Intensity)

Table No.6 target Greenhouse Gas Reduction Every Year Strategy 3S (Electricity and energy consumption intensity) According to Bangkok's goals

พ.ศ.	2567	2568	2569	2570	2571	2572	2573
กลยุทธ์ที่ 1: SCALE UP ENERGY EFFICIENCY							
การเพิ่มประสิทธิภาพพลังงานโดยเปลี่ยนอุปกรณ์ที่มี							
ประสิทธิภาพสูง (ล้านหน่วย)	**1,050**	**2,069**	**3,162**	**4,193**	**6,188**	**8,201**	**10,112**
ภาคครัวเรือน	520	1,040	1,579	2,105	3,121	4,074	5,002
ภาคธุรกิจการค้า	278	557	853	1,138	1,670	2,139	2,675
ภาคอุตสาหกรรม	251	472	730	950	1,397	1,987	2,436
กลยุทธ์ที่ 2: SHIFT TO RENEWABLES							
การติดตั้งโซลาร์รูฟท็อป (เมกะวัตต์)	**60**	**120**	**200**	**280**	**370**	**518**	**635**
ภาคครัวเรือน	30	60	110	160	210	310	427
ภาคธุรกิจการค้า	10	20	30	40	60	84	84
ภาคอุตสาหกรรม	20	40	60	80	100	124	124
กลยุทธ์ที่ 3: STIMULATE SUSTAINABLE TRANSPORT							
การขนส่งอย่างยั่งยืน (ล้านลิตร)	**160**	**321**	**481**	**641**	**962**	**1,283**	**1,603**
การส่งเสริมให้เปลี่ยนไปใช้ระบบขนส่งสาธารณะ	-	-	-	-	-	266	561
การส่งเสริมการใช้ยานพาหนะที่ปล่อยคาร์บอนต่ำ	148	295	443	590	885	914	914
การเดินทางโดยไม่ใช้เครื่องยนต์	13	26	38	51	77	103	128

Table No. 7 Annual greenhouse gas reduction targets of the 3S Strategy (metric tons of carbon dioxide equivalent) according to Bangkok's targets

พ.ศ.	2567	2568	2569	2570	2571	2572	2573
กลยุทธ์ที่ 1: SCALE UP ENERGY EFFICIENCY							
การเพิ่มประสิทธิภาพพลังงานโดยเปลี่ยนอุปกรณ์ที่มี							
ประสิทธิภาพสูง (ตันคาร์บอนไดออกไซด์เทียบเท่า)	**524,826**	**1,034,163**	**1,580,674**	**2,096,207**	**3,093,194**	**4,099,475**	**5,054,989**
ภาคครัวเรือน	260,002	520,004	789,300	1,052,400	1,560,012	2,036,645	2,500,408
ภาคธุรกิจการค้า	139,113	278,226	426,632	568,843	834,677	1,069,532	1,337,057
ภาคอุตสาหกรรม	125,711	235,933	364,742	474,964	698,505	993,299	1,217,524
กลยุทธ์ที่ 2: SHIFT TO RENEWABLES							
การติดตั้งโซลาร์รูฟท็อป (ตันคาร์บอนไดออกไซด์เทียบเท่า	**47,295**	**94,589**	**157,648**	**220,708**	**291,650**	**408,310**	**500,534**
ภาคครัวเรือน	23,647	47,295	86,707	126,119	165,531	244,355	336,579
ภาคธุรกิจการค้า	7,882	15,765	23,647	31,530	47,295	66,212	66,212
ภาคอุตสาหกรรม	15,765	31,530	47,295	63,059	78,824	97,742	97,742
กลยุทธ์ที่ 3: STIMULATE SUSTAINABLE TRANSPORT							
การขนส่งอย่างยั่งยืน (ตันคาร์บอนไดออกไซด์เทียบเท่า)	**400,000**	**800,000**	**1,200,000**	**1,600,000**	**2,400,000**	**3,200,000**	**4,000,000**
การส่งเสริมให้เปลี่ยนไปใช้ระบบขนส่งสาธารณะ	-	-	-	-	-	664,000	1,400,000
การส่งเสริมการใช้ยานพาหนะที่ปล่อยคาร์บอนต่ำ	368,000	736,000	1,104,000	1,472,000	2,208,000	2,280,000	2,280,000
การเดินทางโดยไม่ใช้เครื่องยนต์	32,000	64,000	96,000	128,000	192,000	256,000	320,000

Note: This figure is adjusted according to the energy sector's greenhouse gas reduction targets, with energy efficiency measures such as 5 million and 500,000 tonnes of carbon dioxide equivalent, respectively, due to the replacement of high-efficiency equipment and the installation of rooftop solar power.

In this regard, the group of measures based on the 3S strategy can be divided into two important measures. 1) a set of measures to reduce greenhouse gases from the energy and transport sectors arising from Bangkok's operating activities (Tables 12 and 13), and 2) a set of measures to create an enabling environment for the household sector of commerce and

industry in Bangkok Reduce greenhouse gas emissions from the energy and transport sectors, as shown in Tables 14 and 15.

Table 12: Annual Greenhouse Gas Reduction Targets of the 3S Strategy (Electricity and Energy Consumption Intensity) Based on the Energy and Transportation Sector's Greenhouse Gas Reduction Measures Attributable to Business Activities in Bangkok

พ.ศ.	2567	2568	2569	2570	2571	2572	2573
กลยุทธ์ที่ 1: SCALE UP ENERGY EFFICIENCY							
การเพิ่มประสิทธิภาพพลังงานโดยเปลี่ยนอุปกรณ์ที่มี ประสิทธิภาพสูง (ล้านหน่วย)	5.1	10.1	15.4	20.4	30.1	39.9	49.2
กลยุทธ์ที่ 2: SHIFT TO RENEWABLES							
การติดตั้งโซลาร์รูฟท็อป (เมกะวัตต์)	0.29	0.58	0.97	1.36	1.80	2.52	3.09
กลยุทธ์ที่ 3: STIMULATE SUSTAINABLE TRANSPORT							
การขนส่งอย่างยั่งยืน (ล้านลิตร)	0.01	0.06	0.12	0.22	0.50	0.56	0.58

Table 13 Annual GHG Reduction Targets (metric tons COe) of the 3S Strategy by Group for GHG Reduction Measures in the Energy and Transportation Sectors Arising from Business Activities in Bangkok

พ.ศ.	2567	2568	2569	2570	2571	2572	2573
กลยุทธ์ที่ 1: SCALE UP ENERGY EFFICIENCY							
การเพิ่มประสิทธิภาพพลังงานโดยเปลี่ยนอุปกรณ์ที่มี ประสิทธิภาพสูง (ตันคาร์บอนไดออกไซด์เทียบเท่า)	2,555	5,034	7,694	10,204	15,057	19,955	24,606
กลยุทธ์ที่ 2: SHIFT TO RENEWABLES							
การติดตั้งโซลาร์รูฟท็อป (ตันคาร์บอนไดออกไซด์เทียบเท่า	230	460	767	1,074	1,420	1,988	2,436
กลยุทธ์ที่ 3: STIMULATE SUSTAINABLE TRANSPORT							
การขนส่งอย่างยั่งยืน (ตันคาร์บอนไดออกไซด์เทียบเท่า)	35	138	311	552	1,242	1,387	1,458

Table 14: Annual greenhouse gas reduction targets (electricity and energy consumption intensity) of the 3S strategy according to the group of measures to create an enabling environment for the household sector. Bangkok's annual greenhouse gas reduction targets (in metric tons of carbon dioxide) based on the Action Group to create an enabling environment for Bangkok's commercial, industrial, and household sectors. Bangkok's Commerce & Industry Sector

พ.ศ.	2567	2568	2569	2570	2571	2572	2573
กลยุทธ์ที่ 1: SCALE UP ENERGY EFFICIENCY							
การเพิ่มประสิทธิภาพพลังงานโดยเปลี่ยนอุปกรณ์ที่มี ประสิทธิภาพสูง (ล้านหน่วย)	1,044.75	2,058.67	3,146.59	4,172.84	6,157.51	8,160.67	10,062.78
กลยุทธ์ที่ 2: SHIFT TO RENEWABLES							
การติดตั้งโซลาร์รูฟท็อป (เมกะวัตต์)	59.71	119.42	199.03	278.64	368.20	515.48	631.91
กลยุทธ์ที่ 3: STIMULATE SUSTAINABLE TRANSPORT							
การขนส่งอย่างยั่งยืน (ล้านลิตร)	160.32	320.62	480.89	641.13	961.53	1,282.15	1,602.80

Table 15 Annual greenhouse gas reduction targets (in metric tons of carbon dioxide) for the 3S strategy based on action groups to create an enabling environment for the household sector. Bangkok's Commerce & Industry Sector

พ.ศ.	2567	2568	2569	2570	2571	2572	2573
กลยุทธ์ที่ 1: SCALE UP ENERGY EFFICIENCY							
การเพิ่มประสิทธิภาพพลังงานโดยเปลี่ยนอุปกรณ์ที่มีประสิทธิภาพสูง (ตันคาร์บอนไดออกไซด์เทียบเท่า)	522,271.41	1,029,128.55	1,572,979.94	2,086,002.79	3,078,137.10	4,079,519.97	5,030,382.42
กลยุทธ์ที่ 2: SHIFT TO RENEWABLES							
การติดตั้งโซลาร์รูฟท็อป (ตันคาร์บอนไดออกไซด์เทียบเท่า	47,064.32	94,128.64	156,881.07	219,633.50	290,229.98	406,321.98	498,097.40
กลยุทธ์ที่ 3: STIMULATE SUSTAINABLE TRANSPORT							
การขนส่งอย่างยั่งยืน (ตันคาร์บอนไดออกไซด์เทียบเท่า)	399,965.49	799,861.98	1,199,689.45	1,599,447.92	2,398,757.81	3,198,613.04	3,998,542.16

9.3 Review and Improvement of Bangkok Energy Action Plan

The Bangkok Energy Action Plan 2024~2030 is in line with the Bangkok Climate Change Master Plan 2021~2030. You should consider reviewing the details every year, such as information on energy and traffic conditions, and updating them to the latest version. Energy and transport measures or activities Improve your action plan We may hold meetings with stakeholders for the purpose of hearing opinions and gathering relevant information.

Appendix

Basic contents of the sample project

Based on Bangkok Energy Action Plan 2024~2030

Based on the theme of the seven key measures of the Bangkok Energy Action Plan for the period 2024~2030, the report is divided into two groups: 1) measures to reduce greenhouse gas emissions in the energy and transportation sectors arising from business activities in Bangkok, and 2) 2) measures. A set of measures to create an enabling environment for the household sector. Bangkok's commercial and industrial sector to reduce greenhouse gases from the energy and transportation sectors Bangkok has selected a sample project. Prepare preliminary details of six projects, which will be divided into three groups of measures to reduce greenhouse gases from the energy and transport sectors arising from Bangkok's business activities and a group of measures to create a favorable environment for the household sector. Bangkok's Commerce and Industry Sector In order to reduce greenhouse gas emissions from the energy and transportation sectors, the five projects shown in Table 16 and the details of each project are shown in Table 17 ~ 25.

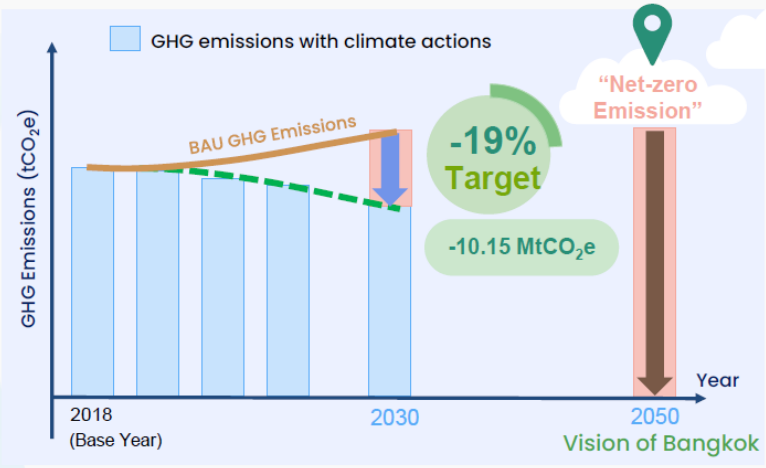
Table 16: Summary of sample projects detailed based on Bangkok Energy Action Plan 2024~2030.

	2567	2568	2569	2570	2571	2572	2573
มาตรการลดก๊าซเรือนกระจกจากภาคพลังงานและภาคการขนส่งที่เกิดขึ้นจากกิจกรรมในการปฏิบัติงานของกรุงเทพมหานคร							
1. การปรับเปลี่ยนระบบปรับอากาศประสิทธิภาพสูงสำหรับอาคารของ BMA	ศึกษา	ดำเนินการ					
2. การติดตั้งระบบโซล่ารูฟท็อปบนหลังคาอาคารของ BMA	ศึกษา	ดำเนินการ					
3. การปรับเปลี่ยนรถเก็บขนมูลฝอยของกรุงเทพมหานครเป็นยานยนต์ไฟฟ้า	ศึกษา	ดำเนินการ					
มาตรการสร้างสภาพแวดล้อมที่เอื้ออำนวยให้ภาคครัวเรือน ภาคธุรกิจการค้าและภาคอุตสาหกรรมในเขตกรุงเทพมหานคร เพื่อลดก๊าซเรือนกระจกจากภาคพลังงานและภาคการขนส่ง							
4. การสนับสนุนการเปลี่ยนรถจักรยานยนต์เป็นรถจักรยานยนต์ไฟฟ้า	ศึกษา	นำร่อง		ขยายผล			
5. การสร้างสภาพแวดล้อมที่เอื้ออำนวยในการเข้าถึงแหล่งเงินทุน	สำรวจ	นำร่อง		ขยายผล			
6. การสร้างสภาพแวดล้อมที่เอื้ออำนวยในการเข้าถึงเทคโนโลยีที่เหมาะสม	รวจและพัฒนาแพลตฟอร์		ให้บริการข้อมูลผ่านแพลตฟอร์ม				
7. การเสริมสร้างศักยภาพบุคลากรเพื่อตอบโจทย์ตลาดแรงงาน	ศึกษา	นำร่อง		ขยายผล			
8. การรณรงค์เพื่อลดก๊าซเรือนกระจกของภาคพลังงานและภาคขนส่ง	ดำเนินการ						
9. การสร้างความตระหนักรู้เพื่อลดก๊าซเรือนกระจกของภาคพลังงานและภาคขนส่ง	ดำเนินการ						

Appendix 2 : Presentation materials of 3rd Workshop on Net Zero Emissions Business Opportunity under Bangkok Yokohama City to City Collaboration Programme: Session 1 presentations

1. Progress on Climate Actions under BMA

GHG Reduction target 2030



- BAU emission = 53.93 $MtCO_2e$
- GHG emission target = 43.78 $MtCO_2e$
- GHG reduction target = 10.15 $MtCO_2e$ (19%)

How to achieve yearly target?

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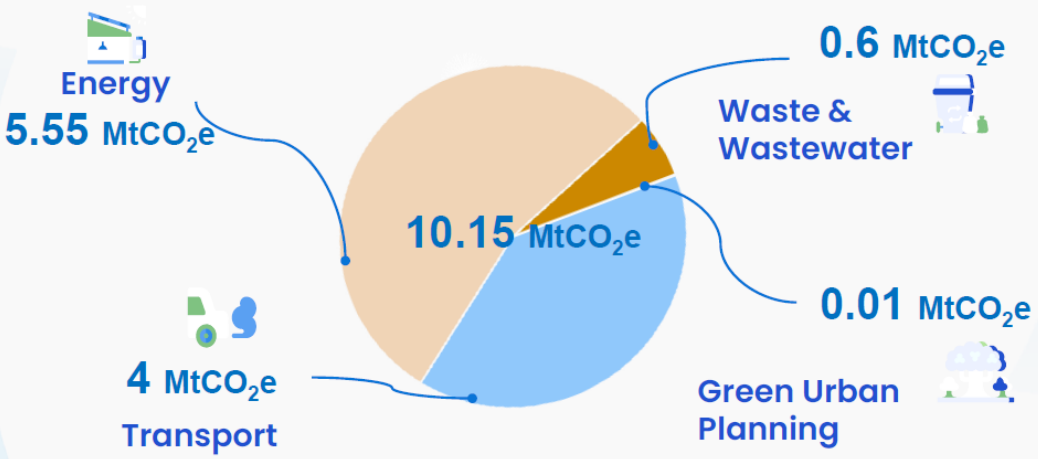
Target by Sector



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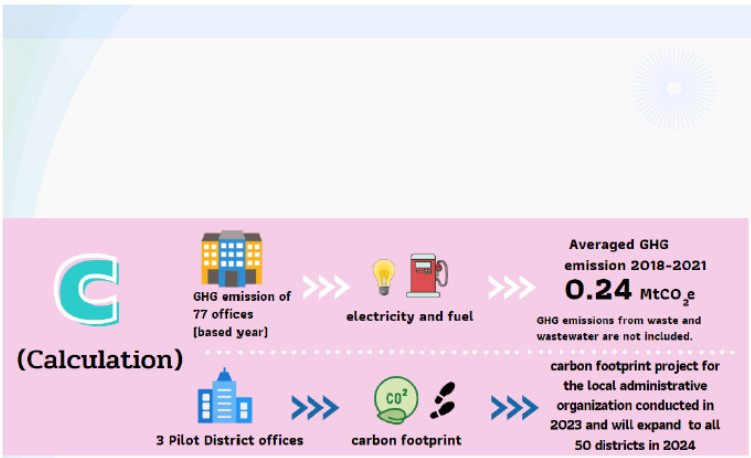
02

BMA Net – Zero Plan



C CALCULATE

Calculate the amount of BMA premises' greenhouse gas emissions

BMA's Carbon Footprint

3 pilot districts:

Din Daeng	2,752 tCO_2e
Bang Khun Thian	4,289 tCO_2e
Prawet	3,278 tCO_2e

*Results from scope 1 - 2

FY 2023
by Collaborating with TGO

FY 2024
Expending to 50 districts

Measure/ Priority Projects

(Reduce)

Year 2023
- Develop Energy Framework under the Project of City to City
- BMA2 Net Zero in 2026
- Reduce energy consumption
- Green Office Project

Year 2024
- Energy Framework Implementation
- BMA2 Net Zero in 2026
- Reduce energy consumption
- Green Office Project
- Install Solar cell
- Promoting EV Cars

R
REDUCE

BMA has plan and implemented the measures to reduce greenhouse gas emissions

R: REDUCE

Energy Efficiency (EE)

-Chiller
- LED

Renewable Energy (RE)

- Solar rooftop
- EV

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R: REDUCE

=30,000- 15,000
=15,000 tCO2/year

รูปเพื่อแสดงตัวอย่างเท่านั้น

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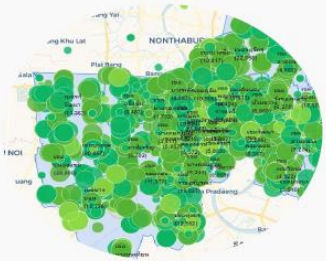
O: OFFSET

Promoting the development of areas which can help capture or absorb the remaining greenhouse gases.

1 Million Trees Planting

Green Data Base



Carbon Credit

1 M Tree Planting

8K tCO_2e/year

*Data from 190,504 trees, 20 year lifetime

Source: Creagy Co., Ltd.

03

From BMA to BKK

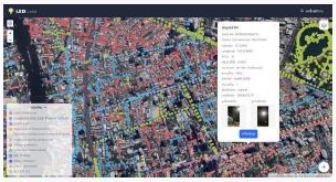
LED Bulbs Replacement

*30,984 LED bulbs

7.9K

tCO_2e/year

Source: Creagy Co., Ltd.



Light bulb replacement tracking platform

BMA Feeder

96K tCO_2e/year

4 เส้นทางประจำ

BTS สนามเป้า – ถนน 2 ดินแดง	635 คน/วัน
ARL ลาดกระบัง – เคหะฯ รังสิตกล้า	868 คน/วัน
MRT บางขุนนนท์ – ตลาดน้ำ	1,353 คน/วัน
10 ร.ร. เขตดุสิต – ฝั่งธนบุรี (ถ.สิรินธร)	265 คน/วัน

3 เส้นทางเทศกาล

สนามกีฬาฯ – สวนลุมพินี	7,139 คน/11 วัน (8-18 ธันวาคม 2565)
MRT วัดมังกร – บางลำพู วัดบวรฯ	769 คน/4 วัน (20-23 มกราคม 2566)
MRT สามยอด – ท่าเรือเกเวศร์	1,843 คน/8 วัน (8-15 เมษายน 2566)

Source: Creagy Co., Ltd.

R: REDUCE

FAR Bonus

20% FAR Bonus for building within 500-800 m. around the existing and upcoming train station

Walkway Development

New Bicycle Route

No Mixed Waste Policy

CO_2

24K – 40K

tCO_2e/year

Source: Creagy Co., Ltd.

R: REDUCE

Straw Compressing Machines

Wastewater Treatment Fee Collection

04

Partnership for the goals

BMA's Cooperation with National Government

- **Steering Committee**
  National government organizations are **member of Steering Committee of Bangkok Master Plan on Climate Change 2021 – 2030** such as Ministry of Natural Resources and Environment, Ministry of Energy, TGO etc.
- **Thai-German Cooperation on Energy, Mobility, and Climate (TGC-EMC) in 2023-2027**
  the joint project between Germany and Thailand to contribute to climate protection and sustainable development and supporting measures for mitigation of GHG emissions
- **EGAT** The project of energy consulting service for efficient electricity use. This will measure the amount of energy consumption before and after changing the high efficiency equipment in BMA building.
- **TGO** BMA has signed MOU for developing the Carbon footprint for 3 district offices in January 2023.

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BMA's Cooperation with Stakeholders

- JICA and Yokohama City (City-to-City Project)
  - Develop the Bangkok Master Plan on climate change
  - Develop Bangkok Energy Action Plan for BMA Net Zero
  - Youth short clip contest on Bangkok climate change
  - Promoting the private sector engagement
- C40
  Bangkok is C40 member city to promote and support the implementation on climate change issue
- GCoM
  BMA has signed MOU in February 2023.
  The objective is to drive the policy and implementation on climate change collaborating with cities and governments in other countries
- public sector, private sector and civil society sector
  such as 60+ Earth hour activity, tree planting, increasing mangrove area, waste separation activity.

THANK YOU

"Climate change is a terrible problem, and it absolutely needs to be solved. It deserves to be a huge priority."

—Bill Gates

2. Future Plan of Bangkok Climate Actions

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Hottest month ever recorded

Sep 2023

9 hottest years ever recorded

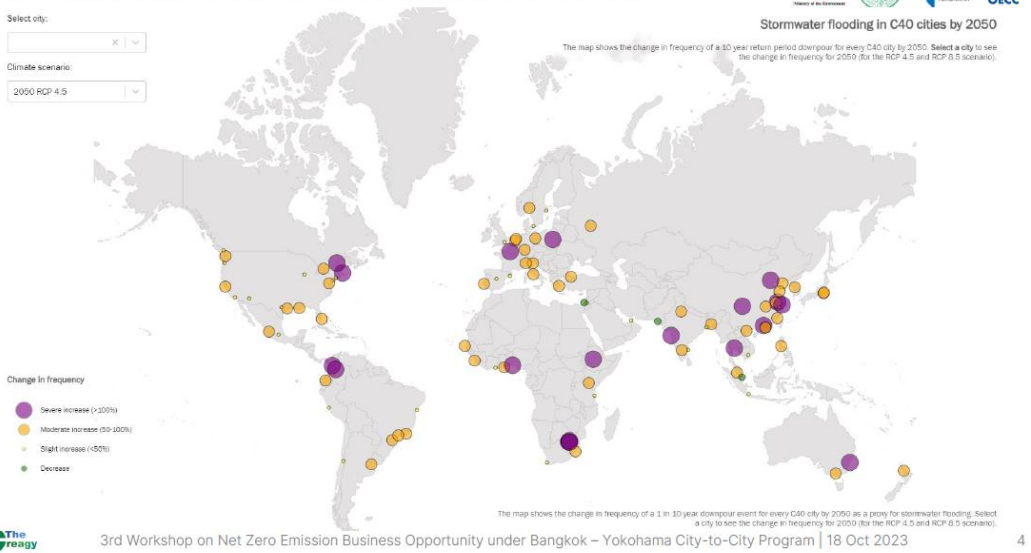
2014 2015 2016

2017 2018 2019

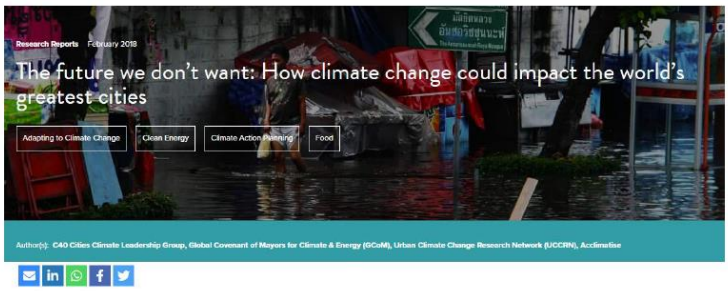
2020 2021 2022

The Creagy Record for global average temperature started in 1880

Climate change increases severe impacts from stormwater flooding to major cities around the world, including Bangkok



Bangkok is at risk to be the top worst-affected cities by climate change in Thailand



Authors(s): C40 Cities Climate Leadership Group, Global Covenant of Mayors for Climate & Energy (GCoM), Urban Climate Change Research Network (UCCRN), Acclimatise

Jump to: Related Knowledge

Billions of people in thousands of cities around the world will be at risk from climate-related heatwaves, drought, flooding, food shortages, blackouts and social inequality by mid-century without bold and urgent action to reduce greenhouse gas emissions.

This research from C40 Cities, Global

Source: C40

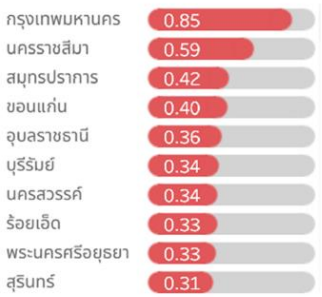
"For decades, scientists have been warning of the risks that climate change will pose from increasing global temperatures, rising sea levels, growing inequality and water, food and energy shortages. Now we have the clearest

Download Resource

Article Topics

Adapting to Climate Change
Adapting to Drought and Water Scarcity

Top 10 Worst-affected provinces by Climate Change (2016 – 2035)



จากแบบจำลอง Ensemble ภายใต้สถานการณ์ RCP 4.5 ช่วงปี 2016-2035

Source: ONEP, https://climate.onep.go.th/th/topic/database/riskmaps

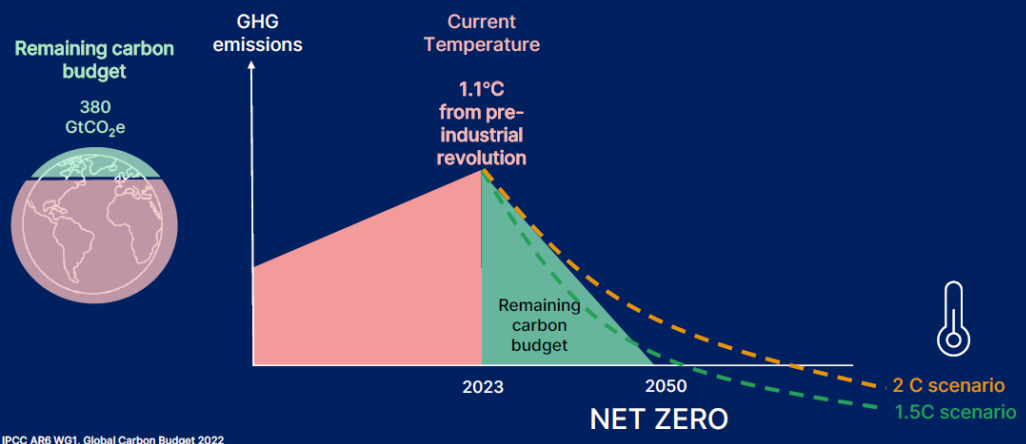
Climate change is already underway, and it is increasingly necessary for Bangkok to plan and implement solutions

The intersection of climate change is relevant to Bangkok in three fundamental ways:

1. **Climate-induced flows** affect Bangkok, its infrastructure and services as well as the socio-economic health.
2. **Climate Actions to Mitigate & Adapt to the climate crisis** can enhance Bangkok to become a more livable city with resilience.
3. **Bangkok is the Center of Activities in Thailand:** Bangkok consumed lot of electricity around 35,000 million kWh (from around 2.93 million users) or 17.5% of Thailand's electricity consumption while creating over 12% percent of GHGs. Thus, Bangkok is part of the solutions.

We must reach Net Zero no later than 2050

To limit global warming to 1.5°C



Source: IPCC AR6 WG1, Global Carbon Budget 2022

The World Came Together and Made Commitments

Paris Agreement Goal: Limiting global temperature increase to well below 2°C, while pursuing efforts to limit the increase to 1.5°C.

> 120 countries have communicated net-zero target & many more countries are considering the targets

Source: Climate Watch Data (2021)

Thailand's Net Zero Pathway

Source: https://www.thaigov.go.th/news/contents/details/72421

รัฐบาลไทย
ROYAL THAI GOVERNMENT

Statement by H.E. Mr. Srettha Thavisin Prime Minister of the Kingdom of Thailand at United Nations Climate Ambition Summit
20 September 2023, United Nations Headquarters, New York

"**At COP26, we pledged to achieve carbon neutrality by 2050. We have also raised our NDCs goal from 20% to 40% by 2030.** We have been working tirelessly to transform this pledge into concrete action as evident in our Long-term Low Greenhouse Gas Emissions Development Strategy.

We have realigned our **National Energy Plan** shifting the focus to **energy efficiency**, making a change in the transport sector, increasing **EVs production**, and **preparing to phase-out coal generated power**.

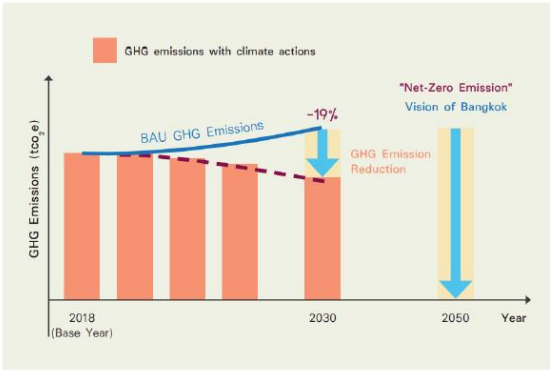
Since taking office, my government wasted no time in implementing a plan to **increase the share of renewable energy**, implement **Utility Green Tariff program, support the usage of solar rooftop and net-metering to incentivize the production of clean energy.** Thailand is determined to increase green area to cover 55% of the total land area by 2037.

...we will **pass the Climate Change Act to regulate mandatory greenhouse gas emission**"

Bangkok Climate Change Master Plan

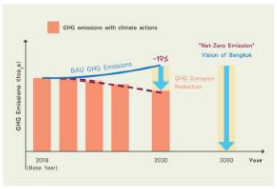
aiming toward Net-Zero Emissions by 2050

GHG Emissions Reduction Target by 2030 and 2050



Bangkok's Future Plan of Climate Actions

1. Create Sense of Urgency
2. Translate Long-term target into Annual targets
3. Develop Coherent& Practical Action Plans
4. Lead by examples, start with BMA

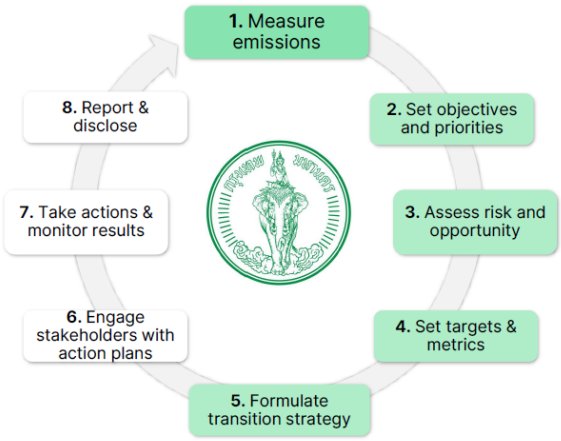


Source: Interviewed from Governor Chadchart Sittipunt

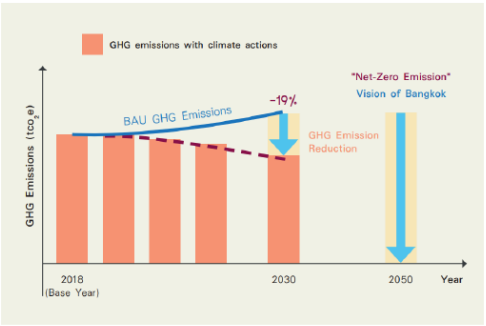
"I want you to act as if the house is on fire, because it is."

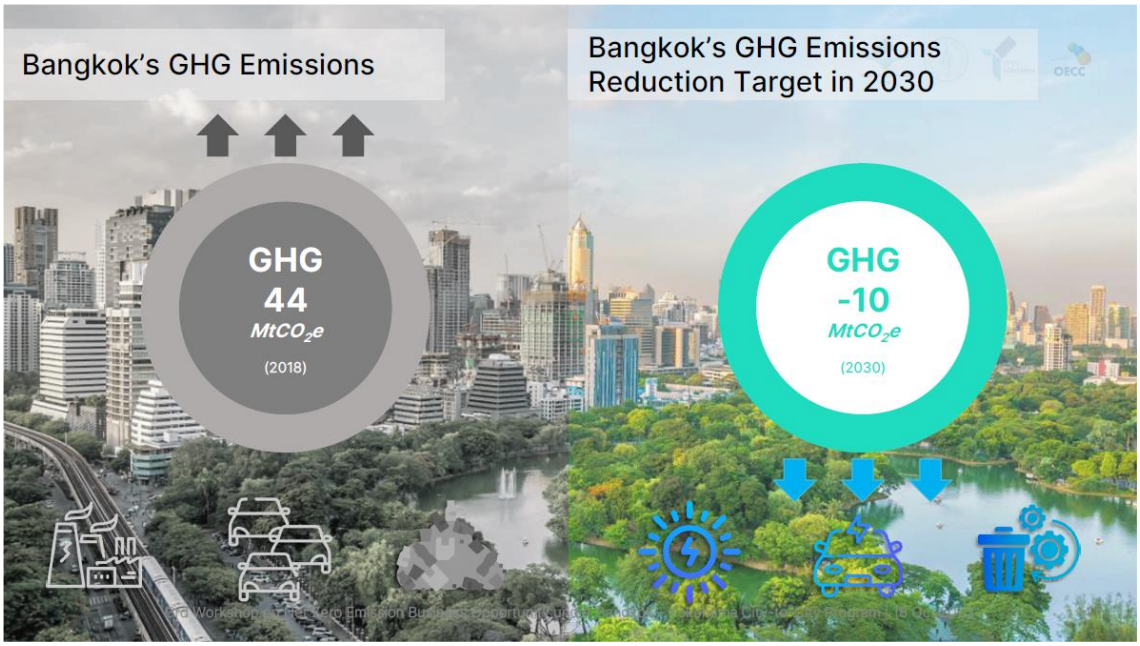
Greta Thunberg, World Economic Forum, 2019

Bangkok Net-Zero Journey



Bangkok GHG emission targets



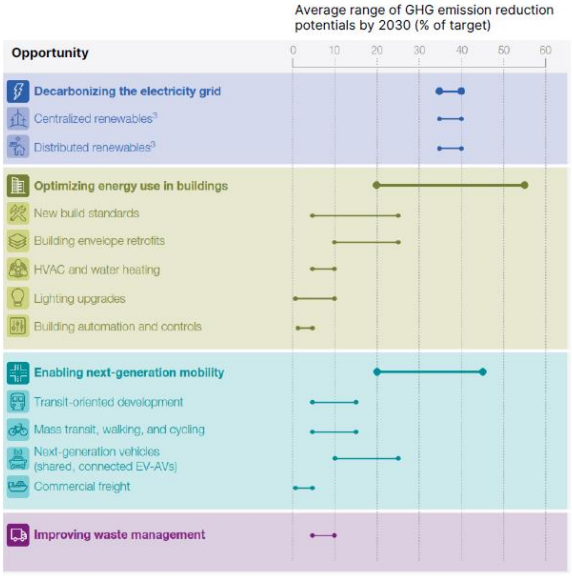


Transport, Energy and Waste Sector must be transformed to achieve the GHG emission targets

Sector	GHG inventory in 2018 (BASIC)	GHG Emissions in 2030 Business-as-usual (A)	GHG mitigation reduction target in 2030 (B)	GHG Emissions in 2030 after mitigation (C) = (A-B)	GHG Reduction (%) (D) = (B/A)
Transport	12.65	14.26	4.00	10.26	28%
Energy	25.74	33.73	5.55	28.18	16%
Waste	5.67	6.14	0.6	5.54	10%
Total (Emission)	**44.06**	**54.13**	**10.15**	**43.98**	**19%**
Green Urban Planning	NE*	NE	0.01**	NE	NE

Unit: $MtCO_2e$

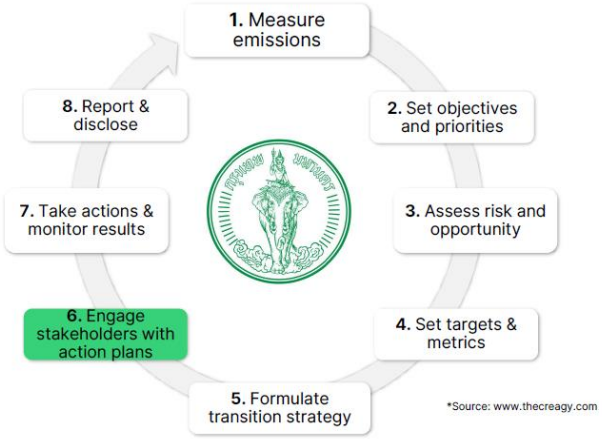
Remark:
* = GHG emission calculation is according to the Agriculture, Forestry and Other Land Use (AFOLU) sector, which is not estimated.
** Calculated from the potential of GHG absorption of Green Urban Planning measures within Bangkok



Source: C40

Bangkok Net Zero Transition Cycle

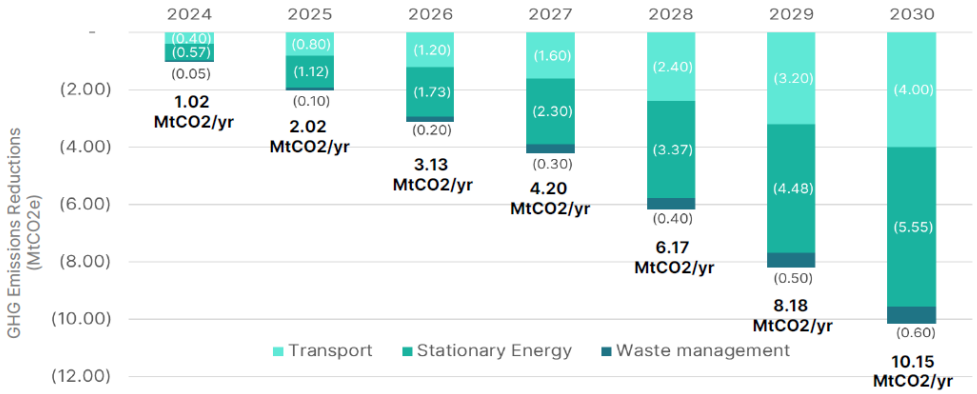
From initial gap analysis to robust reporting, the cycle ensures that businesses not only mitigate their carbon footprint but also adapt, innovate, and thrive in a dynamically changing climate landscape



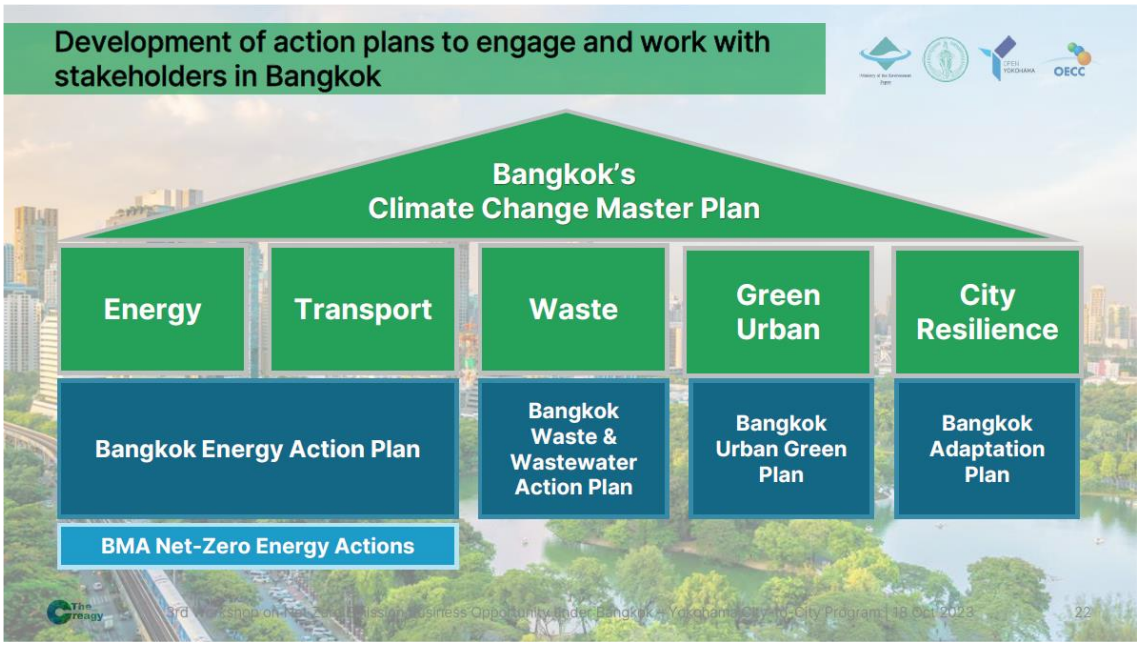
*Source: www.thecreagy.com

Annual GHG Emission Reduction Targets

- The target of 10.15 MtCO2e/yr is break downed the annual targets in each sector.
- In 2024, Bangkok will work to reduce additional 1.02 MtCO2/year.




Examples of policy that can contribute to 10 Million Ton CO_2 Project
เพิ่มรถเมล์สายหลักและรอง ราคาถูกราคาเดียว
Increase bus service in main and minor lines at single and cheap fares
สิ่งแวดล้อมดี
เศรษฐกิจดี
เดินทางดี
จุดจอดจักรยานคุณภาพ ปลอดภัย ทุกจุดเชื่อมต่อขนส่ง
Safe bicycle parking at every point of transit
สิ่งแวดล้อมดี
เดินทางดี
สนับสนุนให้เกิด ecosystem รถพลังงานไฟฟ้า
Supporting the electric car ecosystem
สิ่งแวดล้อมดี
สุขภาพดี
เดินทางดี
สร้างต้นแบบการแยกขยะ ต่อยอดให้การแยกขยะระดับเขตสมบูรณ์ครบวงจร
Creating Waste Sorting Model and Developing Comprehensive Waste Sorting at the District Level
สิ่งแวดล้อมดี
สนับสนุนการแปลงที่ของประชาชนและเอกชนให้เป็นพื้นที่สีเขียว
Support the conversion of public and private space into green space.
สิ่งแวดล้อมดี
ปลูกต้นไม้ล้านต้น สร้างพื้นที่สีเขียวและกำแพงกรองฝุ่นทั่วกรุง
Planting a million trees, creating a green wall to filter dust across the city
สิ่งแวดล้อมดี
สุขภาพดี
พัฒนาแบบจำลองเสมือนกรุงเทพฯ (Digital Twin) เพื่อใช้วางแผนและแก้ปัญหาเมือง
Development of virtual Bangkok model (Digital Twin) for planning development and solving city problems
บริหารจัดการดี


Development of action plans to engage and work with stakeholders in Bangkok
Bangkok's Climate Change Master Plan
Energy
Transport
Waste
Green Urban
City Resilience
Bangkok Energy Action Plan
Bangkok Waste & Wastewater Action Plan
Bangkok Urban Green Plan
Bangkok Adaptation Plan
BMA Net-Zero Energy Actions

Together we can build a city we want...

Bangkok in 1995

Bangkok in 2023

?

Bangkok in 2050

Start with yourself ...

1 **Conserve energy**
- Switch to LED
- Higher air con temp by 1-2°C
- Change to high efficiency electrical appliance

2 **Minimize fossil fuel**
- Walk and bike more
- Public transport
- Carpool
- Consider EV

3 **Consume sustainably**
- Eat less beef
- Opt for reusable products over disposables
- Recycle

4 **Educate yourself**
- Be aware of risks and opportunities related to climate in your profession
- Seek knowledge based on science

5 **Invest in the future**
- Understand business sustainability
- Study carefully climate disclosure before making investment decisions

6 **Spread the word**
- Educate your children about climate change
- Share and discuss with friends and colleagues

"We are the first generation to feel the impact of climate change, and the last generation that can do something about it."

President Barack Obama