

## The 1st Workshop on Net Zero Emissions Business Opportunity under Bangkok-Yokohama City-to-City Program



# Trends of carbon market in Thailand and overseas & new market mechanisms

Boonrod Yaowapruerk

[boonrod@thereagy.com](mailto:boonrod@thereagy.com)

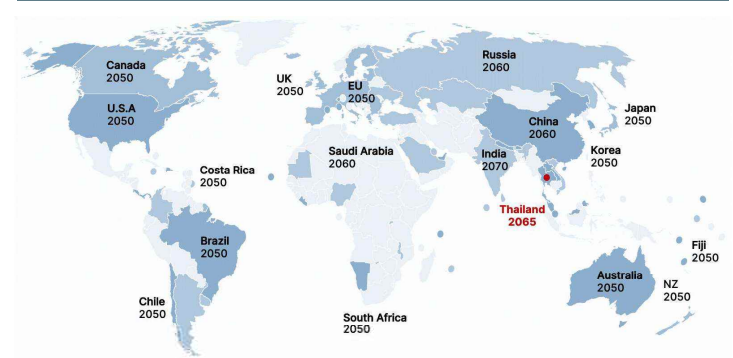
29 Nov 2022

## Paris Agreement & Global Goal

Paris set global net-zero direction for decades into future

1. Limit temperature increase to <2° and achieve net zero emissions by mid-century
2. Enhance resilience and adaptation to climate impacts
3. To align global financial flows with these objectives

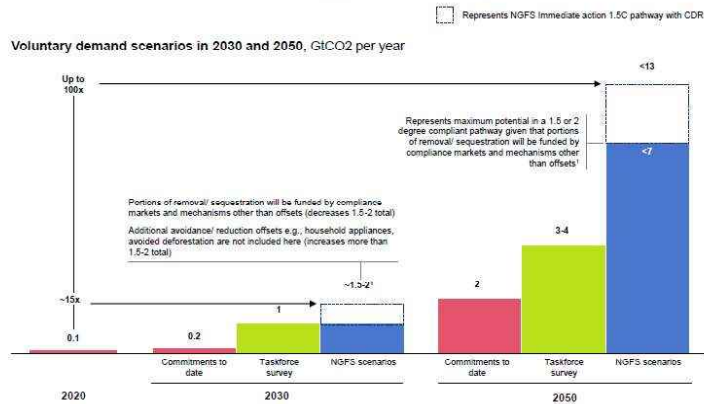
### 83 Countries Now Have Net-Zero Emissions Goal



Source: Climate Watch Data (2021)  
The Reagy

## To meaningfully support a 1.5C pathway, voluntary carbon markets need to grow by >15x by 2030

Taskforce survey projects 1 Gt in 2030 and 3-4 Gt in 2050



1. We note that compliance markets will likely grow over time as regulatory requirements (national and sectoral) increase

Source: TSVCM

### Commitments to date:

Demand that has been established by climate commitments of more than 700 large companies. This is a lower bound as it does not account for likely growth in commitments

### Taskforce survey:

Projected offset demand envisioned by subject matter experts within the Taskforce on Scaling Voluntary Carbon markets (i.e., sits between upper and lower bound)

### NGFS scenarios:

Removal/sequestration required in 1.5-degree and 2-degree NGFS climate scenarios in 2030 and 2050.

This is an upper bound in 2050 as it assumes that all removal/sequestration is supported by voluntary offsets whereas in reality it will be made up by a mix of voluntary and compliance markets as well as mechanisms other than offsets.

### Note:

This analysis (i) does not take into account the split of credits that will be traded in compliance vs. voluntary markets; (ii) is built on a starting assumption that the world is compliant with a 1.5 or 2-degree pathway

## Market size in 2030 will ultimately depend on demand signals and buyer preferences

Scenarios are illustrative rather than forecasts to show need for substantial market growth; market size \$300m in 2019

Scenario	Demand GtCO2/yr		Weighted average price, Per tCO2	Market size
	Weak signal	Strong signal		
A Start with historical supply surplus	1	2	\$5-15	\$5-30 B
B Prioritization of low cost supply			\$10-20	\$10-40 B
C Early investment in technology-based solutions			\$25-35	\$25-70 B
D Preference for local supply			\$50-90 <sup>2</sup>	\$50-180 B
E NGFS price of carbon <sup>1</sup>	N/A [triangulation point only]		\$15-100	N/A [triangulation point only]

Note: This analysis (i) does not take into account the split of credits that will be traded in compliance vs. voluntary markets; (ii) is built on a starting assumption that the world is compliant with a 1.5 or 2 degree pathway

Note: We include NCS that have been costed in our cost curve and exclude NCS that have not been costed (<2.5 Gt)  
1. Uses the same NGFS scenarios as demand scenarios; Delayed 2C with CDR; Immediate 2C with CDR; Immediate 1.5C with CDR  
2. Although credits are available at low costs locally today e.g., agriculture, weighted average price is driven up due to need for technology-based solutions to plug gap between demand and supply

Source: TSVCM

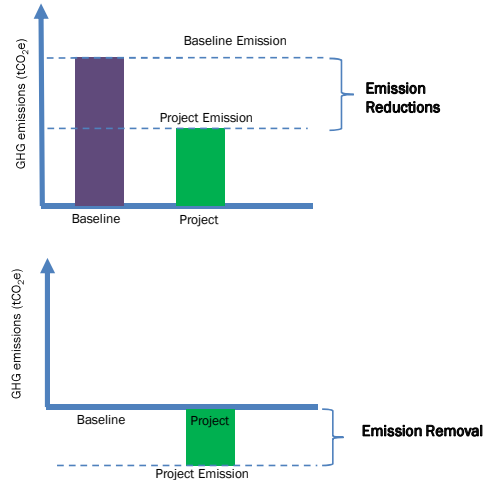
# What are carbon credits and crediting mechanism?

**Carbon credits** are the **verified** emission reductions from the **registered** GHG reduction projects.

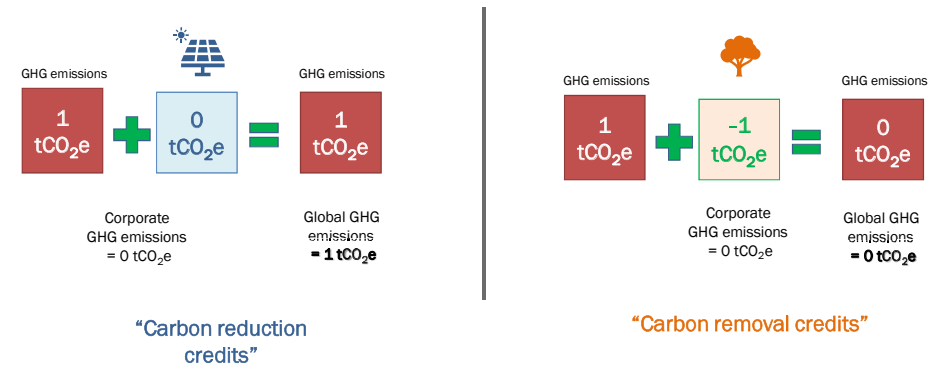
## Crediting mechanism:

Carbon crediting refers to a system that certifies units of emissions reductions and carbon removals/sequestrations generated through projects based on the difference between baseline and actual emissions or removals established through MRV (monitoring, reporting, verification) process, also called baseline-and-credit.

**Not all "Emission Reductions" can become "Carbon Credits".**



# Carbon reduction credits VS Carbon removal credits



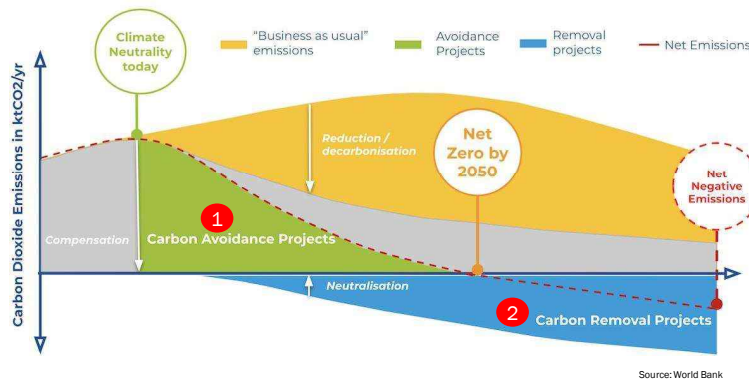
Source: Creagly 2022

# Role of Carbon Credit & Expected Growth Factors

Carbon credit is playing an important role in the Net-Zero Pathway.

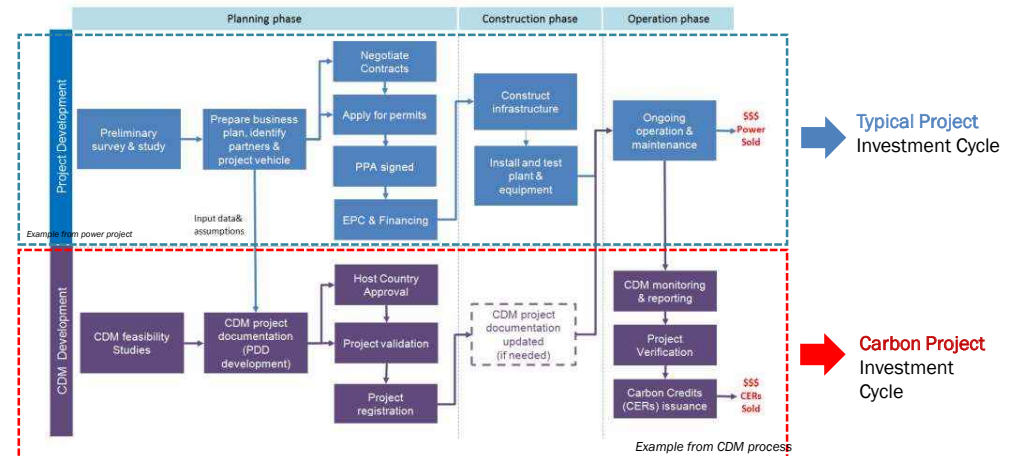
Demand of carbon credit is estimated to be 1,000-2,000 mtCO<sub>2</sub>/yr by 2030 and 3,000-7,000 mtCO<sub>2</sub>/yr by 2050.

- Carbon avoidance/reduction credits can support climate neutrality.
- Carbon Removal credits can support net-zero emissions.



Source: World Bank

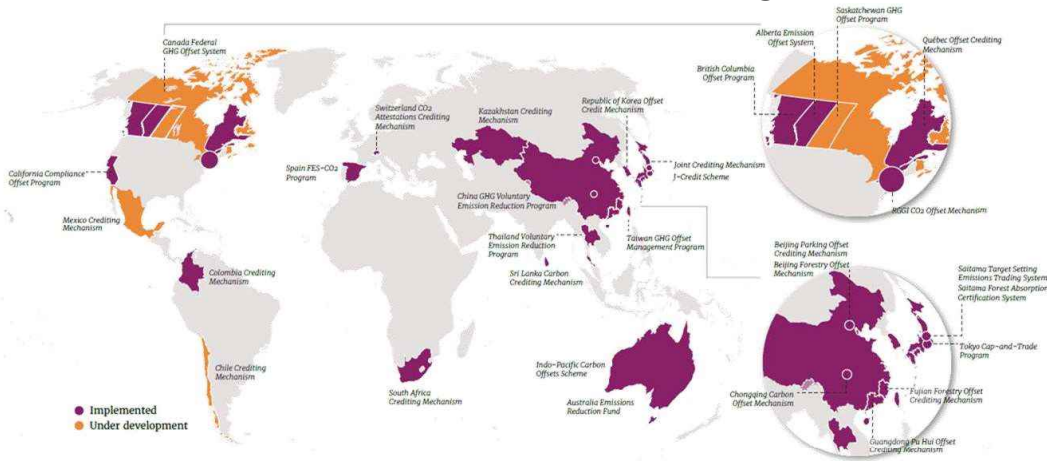
# Typical steps for generating carbon credits



## Remark:

- Project Business development => aiming to produce Products (e.g. electricity, wood product, energy saving, etc)
- Carbon business development => aiming to produce Carbon Credits that could be certified from the Project.

# Map of National & Subnational Carbon Crediting Mechanisms



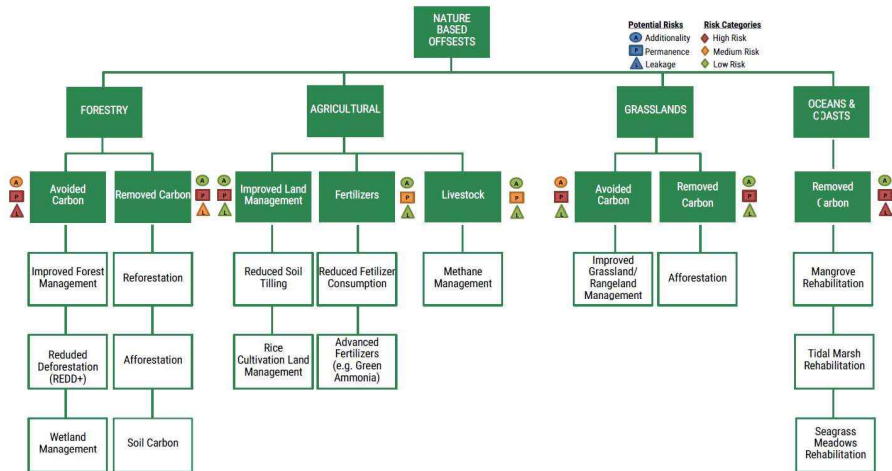
Circles represent crediting mechanisms in subnational jurisdictions and cities. "Implemented" crediting mechanisms have the required framework (e.g., legislative mandate) as well as the supporting procedures, emission reduction protocols and registry systems in place to allow for crediting to take place.



# Carbon Certification Standard



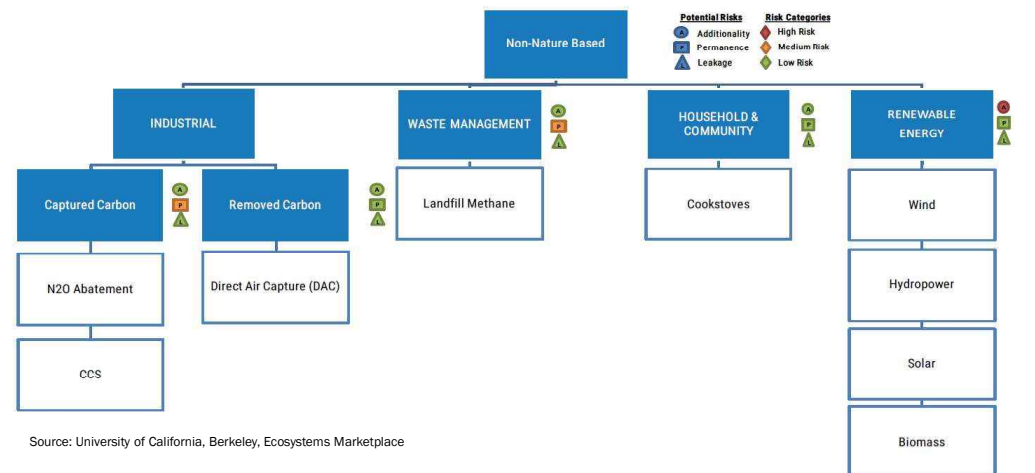
# Nature-based Carbon Credits



Source: University of California, Berkeley, Ecosystems Marketplace



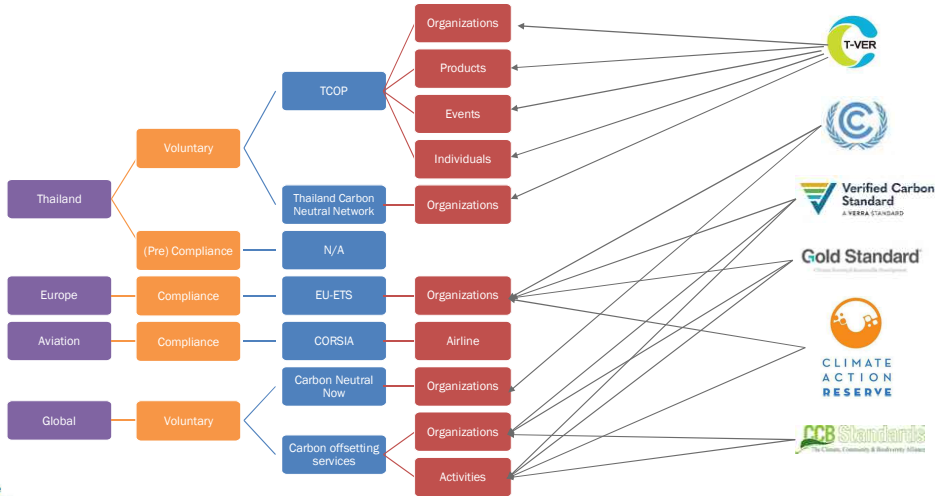
# Non-Nature (or Technology) based Carbon Credits



Source: University of California, Berkeley, Ecosystems Marketplace



## Mapping Demand and Supply of Carbon Credits



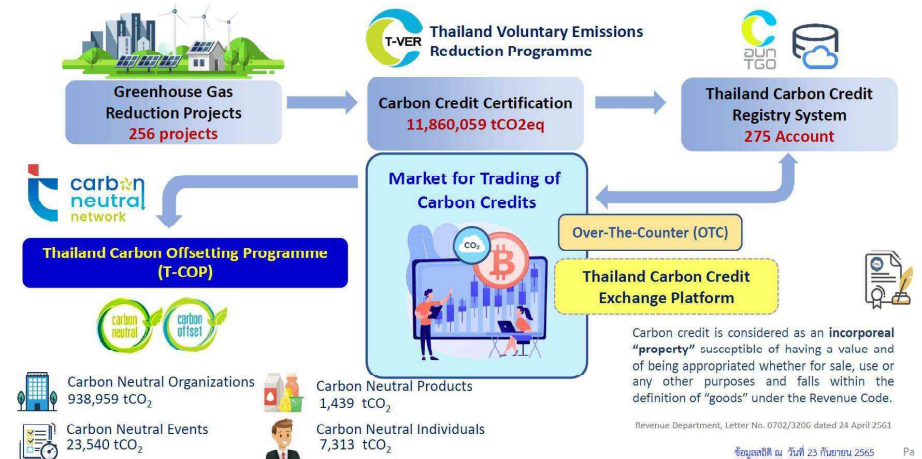
The demand for voluntary carbon credits is rapidly expanding in the past few years.



Forestry and land use credits are the most popular assets in 2021.

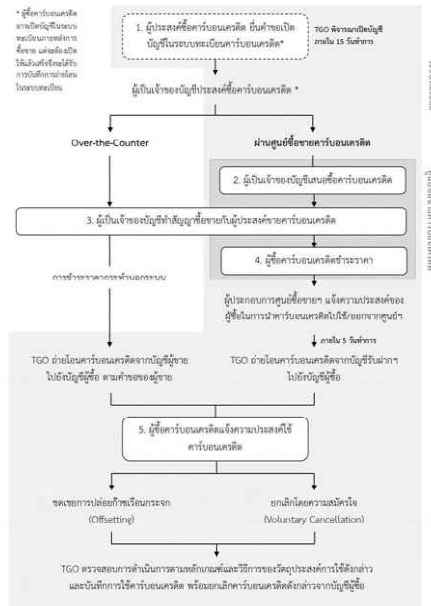
	2020			2021		
	VOLUME (MtCO <sub>2</sub> e)	PRICE (USD)	VALUE (USD)	VOLUME (MtCO <sub>2</sub> e)	PRICE (USD)	VALUE (USD)
<b>FORESTRY AND LAND USE</b>	57.8M	\$5.40	\$315.4M	227.7M	\$5.80	\$1,327.5M
<b>RENEWABLE ENERGY</b>	93.8M	\$1.08	\$101.5M	211.4M	\$2.26	\$479.1M
<b>CHEMICAL PROCESSES / INDUSTRIAL MANUFACTURING</b>	1.8M	\$2.15	\$3.9M	17.3M	\$3.12	\$53.9M
<b>WASTE DISPOSAL</b>	8.5M	\$2.69	\$22.8M	11.4M	\$3.62	\$41.2M
<b>ENERGY EFFICIENCY / FUEL SWITCHING</b>	30.9M	\$0.98	\$30.4M	10.9M	\$1.99	\$21.9M
<b>HOUSEHOLD / COMMUNITY DEVICES</b>	8.3M	\$4.34	\$36.2M	8.0M	\$5.36	\$43.3M
<b>TRANSPORTATION</b>	1.1M	\$0.64	\$0.7M	5.4M	\$1.16	\$6.3M
<b>AGRICULTURE</b>	0.5M	\$10.38	\$4.7M	1.0M	\$8.81	\$8.7M

Thailand Voluntary Carbon Market is also growing, but the market size is still small.

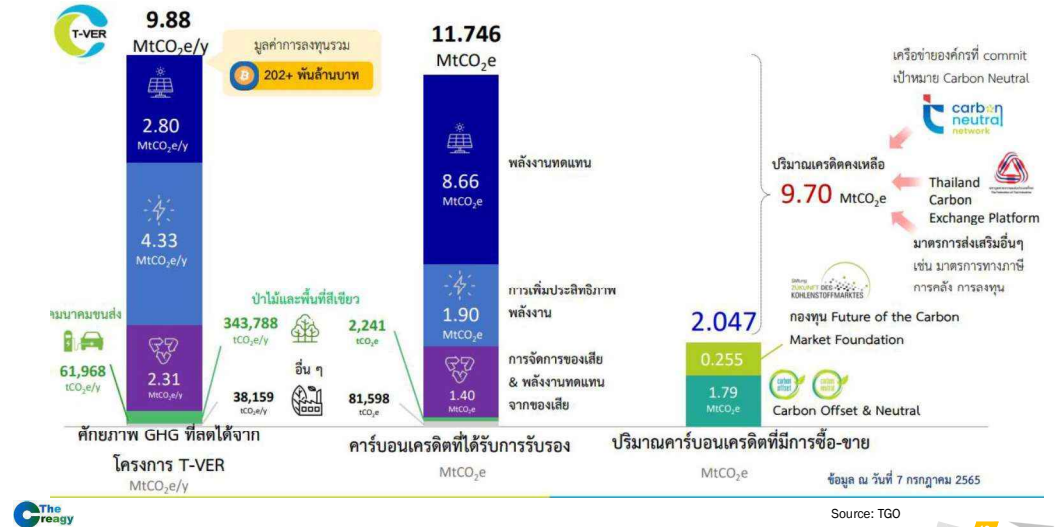


Carbon credit is considered as an incorporeal "property" susceptible of having a value and of being appropriated whether for sale, use or any other purposes and falls within the definition of "goods" under the Revenue Code.

Revenue Department, Letter No. 0702/3206 dated 24 April 2561



### Volume traded of TVERs during 2015-2021

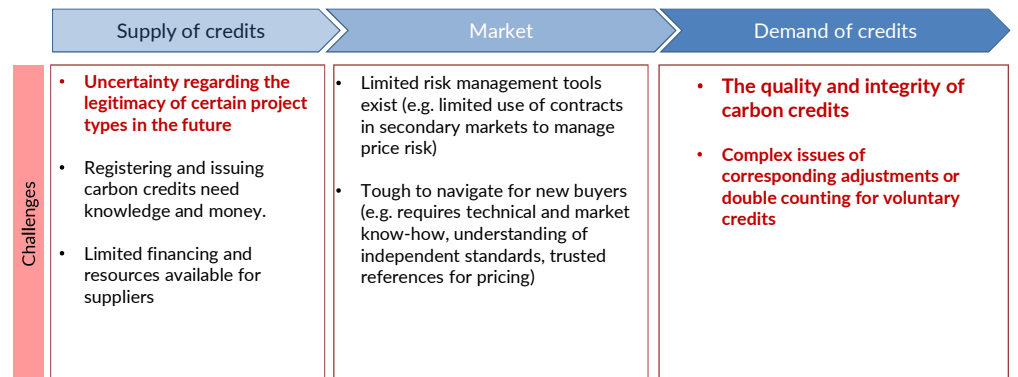


### Volume traded of TVERs during 2015-2021

Fiscal Year	Trading Volume (tCO <sub>2</sub> e)	Trading Value	Avg. price per tonne (THB)	ประเภทโครงการ	ราคาต่ำสุด (บาท)	ราคาสูงสุด (บาท)	ราคาเฉลี่ย (บาท)	ปริมาณการซื้อขาย (tCO <sub>2</sub> eq)
2559	5,641	846,000	149.97	ชีวภาพ	130	200	132.86	605,610
2560	33,468	1,006,000	30.06	ชีวมวล	19	500	27.74	778,749
2561	144,697	3,090,520	21.37	พลังงานน้ำ	80	200	87.30	45,489
2562	131,028	3,246,980	24.78	Waste Heat Recovery	-	20	20.00	1,000
2563	169,806	4,375,686	25.77	พลังงานแสงอาทิตย์	21.50	500	23.87	109,137
2564	286,580	9,714,193	33.90	ทำปุ๋ยหมัก (Composting)	200	320	200.62	4,838
2565	1,020,650	119,997,602	117.57	ป่าไม้	-	1,868.75	-	16
				Methane Recovery and Utilization	130	135	132.50	245,284
				อื่นๆ (CO <sub>2</sub> Recovery)	15	100	63.70	1,747

Note: Data source is from certified T-COP of TGO, as of 7 July 2022

Inconsistent governance due to multiple voluntary programmes, lack of basic standardized rules or documents, and mixed views on what makes **Quality carbon credit & Quality of claims** are amongst key challenges.



Challenges

- **Uncertainty regarding the legitimacy of certain project types in the future**
- Registering and issuing carbon credits need knowledge and money.
- Limited financing and resources available for suppliers

- Limited risk management tools exist (e.g. limited use of contracts in secondary markets to manage price risk)
- Tough to navigate for new buyers (e.g. requires technical and market know-how, understanding of independent standards, trusted references for pricing)

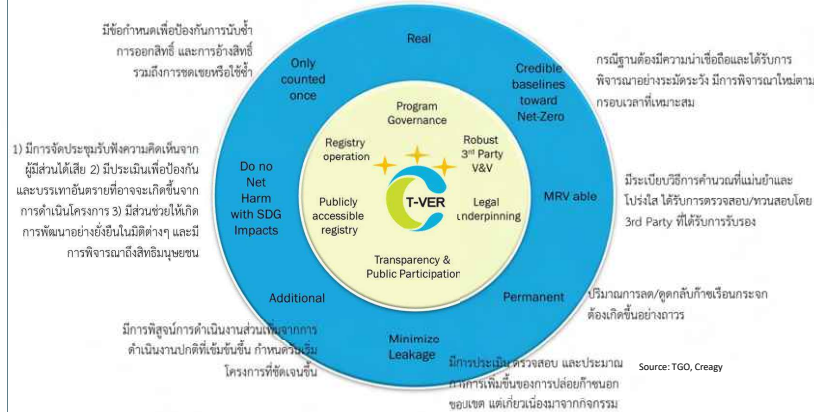
- **The quality and integrity of carbon credits**
- **Complex issues of corresponding adjustments or double counting for voluntary credits**

## The Premium T-VER is Supporting Global Goals and Aligning with the Paris Agreement, however, it has direct impact to project developer

Thailand's T-VER program is in the process of enhancing its quality at both carbon crediting mechanism level and at the program operational level.

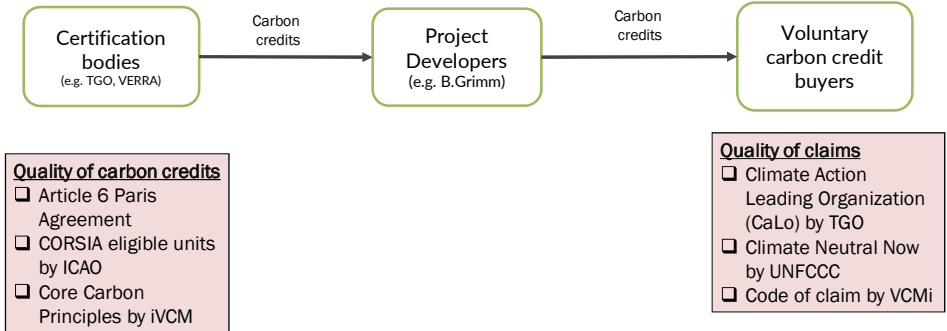
This enhancement align with the Core Carbon Standard (CCPs), CORSIA eligible units' requirements, and other international standard.

Thus, registering T-VER projects and issuing TVER credits will be much more challenges in the future.



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## Inconsistent governance due to multiple voluntary programmes, lack of basic standardized rules or documents, and mixed views on what makes a quality carbon credit are amongst the key challenges in VCM



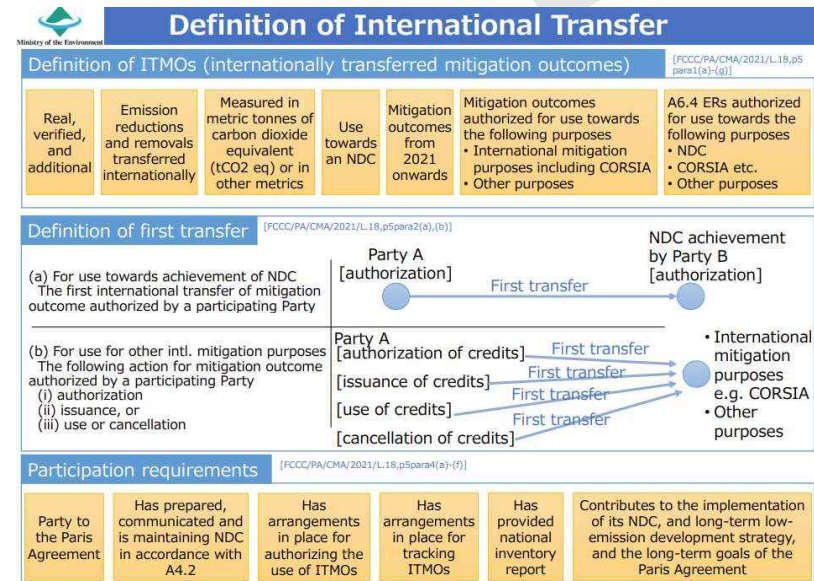
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## Voluntary cooperation under Article 6 of the Paris Agreement

- Article 6 of the Paris Agreement recognizes that parties may cooperate voluntarily in implementation of their NDCs, to allow for higher ambition and to promote sustainable development and environmental integrity.
- Article 6.3 of the Paris Agreement introduced the concept of authorisation, by providing that the use of Internationally Transferred Mitigation Outcomes (ITMOs) to achieve Nationally Determined Contributions (NDCs) needs to be authorised by participating Parties. Authorisation is an essential part of voluntary cooperation under Article 6, because it determines when mitigation outcomes (MO) become ITMOs.
- The different possible ways to interpret and implement Article 6 authorisation have implications for the attractiveness of participation in Article 6 activities, both for Parties and for the private sector.
- Transferring Parties will need to find a balance in establishing conditions that would encourage private sector participation for the generation of ITMOs in a given implementation period, while not hindering the achievement of their NDCs.

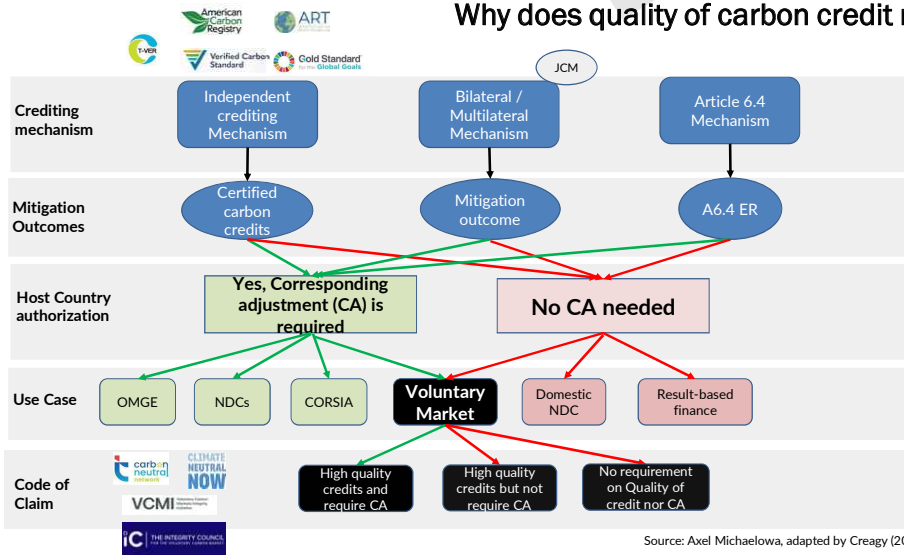


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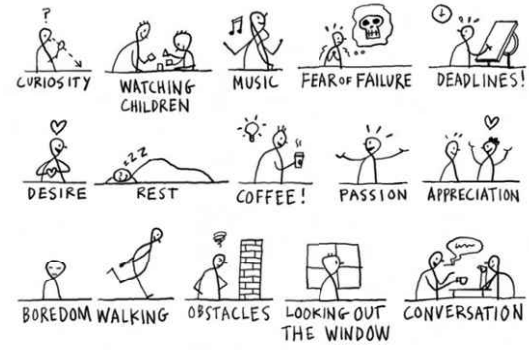


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# Why does quality of carbon credit matter?



## WHAT IGNITES CREATIVE ENERGY?



Thank you

[www.thecreagy.com](http://www.thecreagy.com)



# Workshop on Net Zero Emissions Business Opportunity under Bangkok-Yokohama City-to-City Program OECC's activities on JCM project development -Potential of JCM in Thailand-

November 29, 2022

Overseas Environmental Cooperation Center, Japan (OECC)

Jun Watanabe

## For more information about the JCM...

**Website & Facebook**

**Good practice**

Solar power project promoting SDG 7 & 17 @Kenya

East Africa's largest salt refinery at Gongoni in Malindi District

- Krystalline Salt Ltd. has been joining the UN Global Compact since 2013.
- Displace electricity use from both grid and diesel generators
- Save 22% of our annual electricity costs
- Reduce 368 tCO2/year
- Installation of the PV system under the JCM is reported as activities to achieve SDG 7: Affordable and clean energy & SDG 17: Partnerships for the goal.
- \*Cemex/J. Chemonics/oecc
- Program ID: J-2018 for the UNFCCC Contract.

Annual, solar and wind energy production, \*Kenya's NDC (2015)

**Media**

**Movie**

Ms. Yanery Ortega  
Asst. Palestine Secretary Council

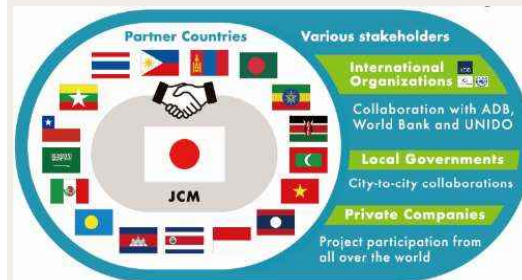
inacaste donated a complete pumping system.

**Mail magazine, help desk, etc.**



Please visit Carbon Markets Express website ->

## Roles of OECC in the JCM



### Roles of OECC promoting the JCM

- **Outreach activities**  
Providing JCM related information through website, SNS, mail magazine, help desk, seminars.
- **Project development support**  
Supporting companies to develop JCM projects through consulting work (site visit, study tour to Japan, supporting application to the JCM).

### 1 JCM×Carbon neutral project

Formulating and scaling up JCM projects through collaboration among various stakeholders.



Aiming at a cumulative 100 million tCO2 emission reduction by 2030.

### 2 JCM×Article 6

Developing and implementing the JCM in accordance with Article 6 of the Paris Agreement.



Promoting sustainable development and ensuring environmental integrity and transparency.

### 3 JCM×SDGs

Enhancing contributions to SDGs through implementation of JCM projects.



Contributing to multiple SDGs goals and targets.

## COP27 Side Event

### Promoting and Expanding Implementation of the Joint Crediting Mechanism (JCM) [Nov. 8 @Japan Pavilion]



<https://enb.iisd.org/joint-crediting-mechanism-jcm-implementation>



# Supporting JCM Project development



## Activity flow of the JCM model project development and support from OECC

Identifying project partners / technologies



Supporting to solve issues for project partners

- Applying to JCM Model Project
- Supporting application forms

- Pre-study on potential technologies
- Meeting with potential project partner
- Workshop

Bridging with Japanese companies



Maturity process toward business formation

- Financial Arrangement
- Study Tour
- Discussion with partner country



Major steps for JCM Project development support from OECC

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# JCM Financing Programme (JCM Model Project)

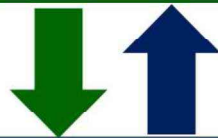


Budget for projects starting from FY 2022 is approx. **17.1 billion JPY** (approx. **USD 158 million**) in total by FY2024 (1 USD = 108 JPY)

**Government of Japan**

\*Includes collaboration with projects supported by JICA and other governmental-affiliated financial institute.

Finance part of an investment cost (up to half)



Conduct MRV and expected to deliver JCM credits issued

**International consortiums (which include Japanese entities)**



- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects: starting installation after financing is awarded and finishing installation within three years.

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# Recent JCM model projects supported by OECC



OECC has successfully supported over 20 JCM model projects in Asia.

Year	Partner country	Project
2022	Thailand	<b>Thermal Energy Supply and Methane Avoidance Project Utilizing Biomass mixed with Biogas from Wastewater in Fruit Processing Factory</b>
2021	Indonesia	Introduction of 3.3MW Rooftop Solar Power System in Woodworking Factories
2020	Myanmar Philippines Vietnam	7.3MW Solar PV in Mandalay International Airport and Yangon City 2MW Solar PV at Shopping Mall (JCM Eco Lease Scheme) 2MW Solar PV for Pellet Factory
2019	Philippines Mongolia	Biogas Power Generation and Fuel Conversion Project in Pineapple Canneries Fuel Conversion by Introduction of LPG Boilers to Beverage Factory

# Examples of JCM Model Projects by Technology



<b>Energy Efficiency</b>			
Chiller (Thailand) The Sunway Electric Power Company, Incorporated	Boiler (Viet Nam) Asecook Co., Ltd.	Amorphous Transformers (Lao PDR) Yuko Kasei Co., Ltd.	LPG Boilers (Mongolia) Sakushin Co., Ltd.
<b>Energy Efficiency</b>		<b>Effective Use of Energy</b>	
Raw Water Intake Pumps (Viet Nam) Yokohama Water Co., Ltd.	Energy Efficient Distillation System (Mexico) SUMIFORY SPIRITS LTD.	Waste Heat Recovery (Myanmar) Gobot Engineering Co., Ltd.	Gas Cogeneration System & Chiller (Thailand) KANSAI ELECTRIC POWER CO., INC.
<b>Renewable Energy</b>			
Binary Geothermal Power Generation (Philippines) Mitsubishi Heavy Industries, Ltd.	Mini Hydro Power (Indonesia) Toyo Energy Farm Co., Ltd.	Solar Power (CSP) Farmland Co., Ltd.	Solar Power (PV) Sharp Energy Solutions Corporation
<b>Renewable Energy</b>		<b>Waste Handling and Disposal</b>	
Biogas Power & Fuel Conversion (Philippines) Tochu Corporation	Power Generation with Methane Gas Recovery System (Mexico) NTT Data Institute of Management Consulting, Inc.	Waste to Energy Plant (Myanmar) JFE Engineering Corporation	CNG-Diesel Hybrid Public Bus (Indonesia) Hokusan Co., Ltd.

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- ❑ Japan launched the "Paris Agreement Article 6 Implementation Partnership" towards high integrity carbon markets, at COP27. [Nov.16, 2022]
- ❑ Promoting international collaboration for capacity building related to the Article 6, including by sharing good practices and supporting the implementation of Article 6.
- ❑ 40 countries and 23 institutions have pledged to participate the partnership.

### Areas of work

- Facilitate understanding of Article 6 rules and linkages with NDCs
- Share good practices for institutional arrangements incl. authorization and recording
- Develop an information platform for Article 6 implementation
- Conduct mutual learning and trainings for Article 6 reporting and review
- Support baseline methodology (tool development, etc.)
- Designing of high integrity carbon markets



[https://www.env.go.jp/en/press/press\\_00741.html](https://www.env.go.jp/en/press/press_00741.html) 13

## Thank you for your attention!

**Overseas Environmental Cooperation Center, Japan (OECC)**

TEL : 03-5812-4104 FAX : 03-5812-4105

Website: <https://www.oecc.or.jp/>

Email: [watanabe@oecc.or.jp](mailto:watanabe@oecc.or.jp)



## THE 2<sup>ND</sup> WORKSHOP ON NET-ZERO EMISSION BUSINESS OPPORTUNITY Under Bangkok-Yokohama City-To-City Program



2<sup>nd</sup> March 2023



08:15-14:50



@Mandarin Grand Ballroom  
(2<sup>nd</sup> floor),  
Mandarin Hotel Bangkok

### Objectives

- Exchange knowledge on low-carbon and decarbonising technologies between Japan and Thailand
- Understand the roles of carbon credits and carbon market mechanism
- Promote business matching and project development among Thai and Japanese

### Agenda

- 08:15-08:45 Registration
- 08:45-09:15 Welcoming remarks by City of Yokohama, Ministry of the Environment, Japan and Embassy of Japan in Thailand  
Opening remark by the Governor of Bangkok
- 09:15-10:00 Plenary session 1: BMA's plan and action for Climate Change by BMA, JICA and Creagy
- 10:00-10:15 Break
- 10:15-11:45 Plenary session 2: Carbon credit and ESG finance by TGO, EGAT and OECC
- 11:45-13:00 Networking lunch
- 13:00-13:50 Smart City and Energy Transitions: Experiences from Thailand by SCG, Sena Development, Energy Absolute and EXIM
- 13:50-14:40 Smart City and Energy Transitions: Experiences from Japan by JGC, FOMM and Tokyo Century Corporation
- 14:40-14:50 Closing remark by Advisor to Governor of Bangkok (Mr. Pornphrom N.S. Vikitsret)



REGISTRATION

<https://forms.office.com/r/9ai70AaGKJ>



# Bangkok Master Plan on Climate Change 2021 - 2030

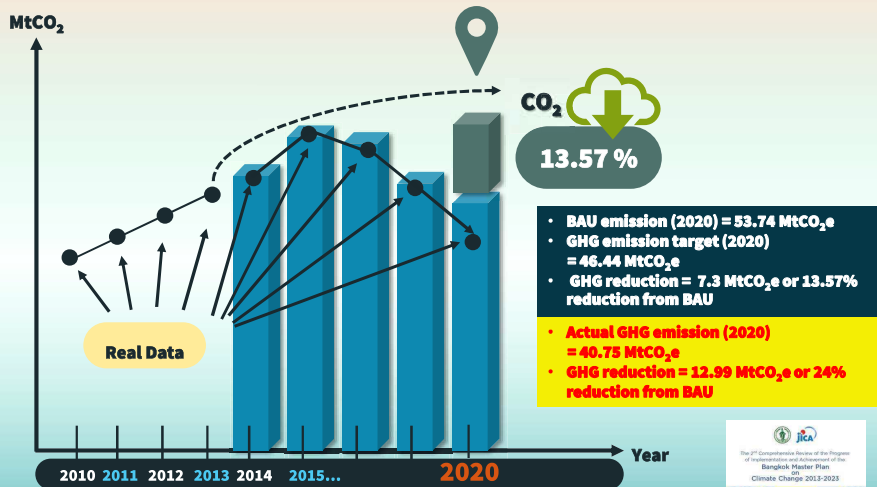
Ms. Woranuch Suaykakaow  
Deputy Director General of Department of Environment, BMA

2 March 2023

## Milestone of Bangkok Climate Change MP Development

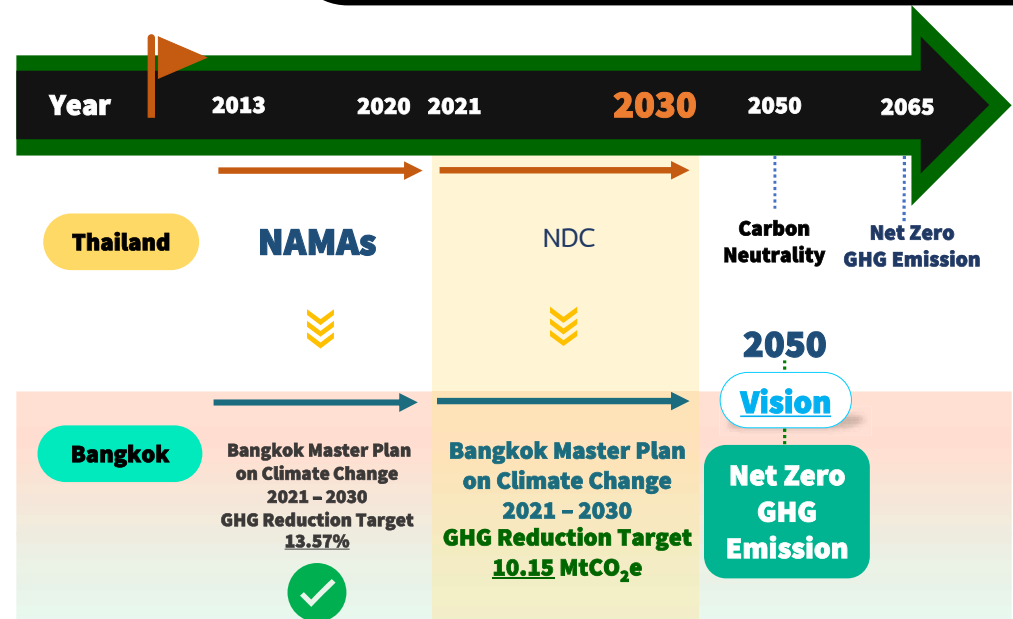


## Great Achievements of 2020 mitigation target



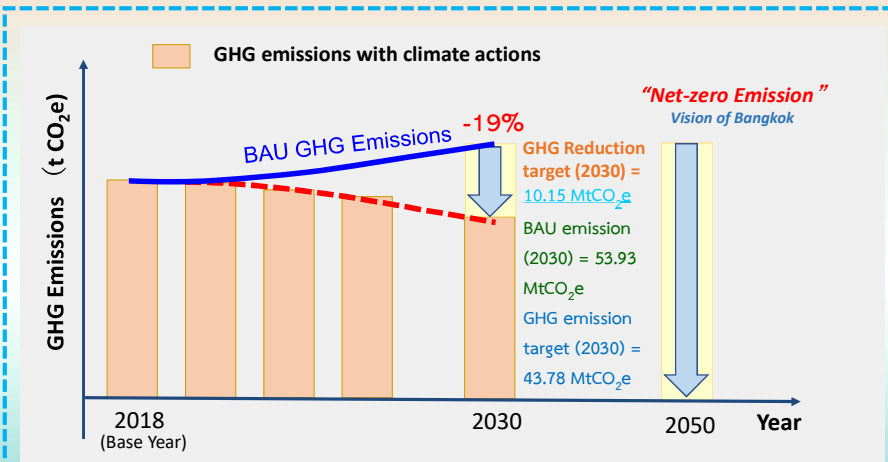
Source: BMA & JICA (2022) "The 2<sup>nd</sup> Comprehensive Review of the Progress of Implementation and Achievement of the Bangkok Master Plan on Climate Change 2013-2023"

## Bangkok's GHG Reduction Target for 2030



หมายเหตุ: Nationally Appropriate Mitigation Actions : NAMAs การดำเนินงานลดก๊าซเรือนกระจกที่เหมาะสมของประเทศ  
Nationally Determined Contribution : NDC เป้าหมายการลดก๊าซเรือนกระจกของประเทศ

## Bangkok's GHG Reduction Target for 2030



**Bangkok's interim target for 2030 and long-term vision towards Net-zero emission by 2050**

## Bangkok Master Plan on Climate Change 2021-2030

### Vision 2030

**"Bangkok moves toward a green, livable and climate-resilient city, under nationwide collaboration for sustainable development."**

"กรุงเทพมหานครมุ่งสู่เมืองสีเขียวที่น่าอยู่ พร้อมรับมือกับการเปลี่ยนแปลงสภาพภูมิอากาศ โดยความร่วมมือจากทุกภาคส่วนเพื่อการพัฒนาที่ยั่งยืน"

### Vision 2050

**"Bangkok as a livable and innovative city, pursuing efforts to achieve net-zero emissions and enhancing resilience in all aspects."**

"กรุงเทพมหานครเมืองน่าอยู่ มุ่งพยายามในการปล่อยก๊าซเรือนกระจกสุทธิเป็นศูนย์ มีนวัตกรรมที่ยั่งยืน พร้อมรับมือและปรับตัวต่อการเปลี่ยนแปลงทุกมิติ"



## The Bangkok Master Plan on Climate Change 2021 - 2030

### Mitigation

There are 5 sectors as follow;

- Transportation
- Energy
- Waste and Wastewater
- Green Urban Planning

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### Adaptation

1. Water Management
2. Agriculture & Food Security
3. Tourism
4. Public Health
5. Natural Resources
6. Human Settlement & Security

Bangkok's adaptation plan is designed to be in line with the National Adaptation Plan (NAP).

1

## Transportation

Example of Project/ Measure

☐ Mass Transit



- Promotion of public transportation



- Development/Improvement of water transport



# 1 Transportation

## Mobility (Last Mile Connectivity)

- Improvement of connectivity of public transportation
- Development/Expansion of Park & Ride
- Promotion of Low Emission Vehicles Feeder to public transportation



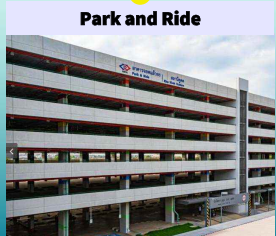
Bike Sharing



Public Transportation



BMA Feeder



Park and Ride



3 Wheels EV Motorcycle



EV Motorcycle

# 5 Adaptation

## Example of Project/ Measure

- Increase the ability to cope with flood disasters
- Construction of drainage tunnels
- Development of water retention (Monkey Cheek)
- Coastal erosion prevention in Bang Khun Thian



**WATER BANK**  
BMA กรุงเทพมหานคร  
โครงการกักเก็บน้ำไว้ใช้ในพื้นที่เสี่ยงน้ำท่วม  
ได้สะพานข้ามแยกถนนรัชดาภิเษกตัดถนนวิภาวดี

- 1. การขุดลอกคลอง
- 2. การขุดลอกคูน้ำ
- 3. การขุดลอกคูน้ำ
- 4. การขุดลอกคูน้ำ
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- 7. การขุดลอกคูน้ำ
- 8. การขุดลอกคูน้ำ

# 2 Energy

## Example of Project/ Measure

Installation of Solar PV Rooftop  
Improve and install high - efficiency equipment  
(air conditioners, bulbs)



# 3 Waste and Wastewater

Reducing and separating solid waste at source  
Using organic waste to make soil amendments  
Collecting wastewater into the system

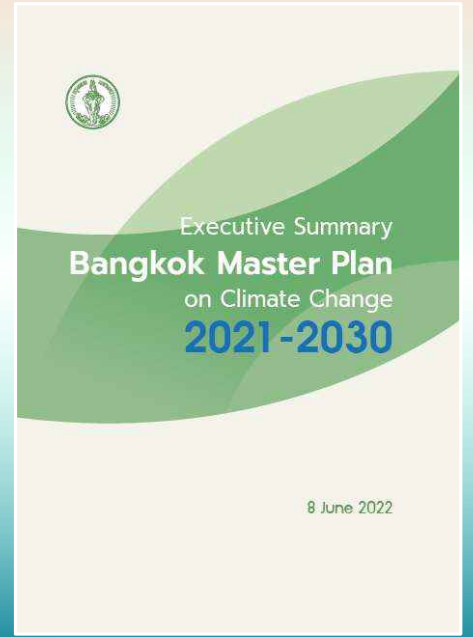
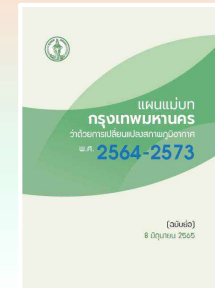


# 4 Green Urban Planning

Increasing new green areas in public areas  
Mangrove reforestation  
Green incentive



## The Bangkok Master Plan on Climate Change 2021 - 2030



Download Here:



<https://climatechange.bangkok.go.th/ccs-blog/>



**BMA**  
**กรุงเทพมหานคร**  
BANGKOK METROPOLITAN ADMINISTRATION

# Thank you

## Contact us

**Climate Change Strategies Sub-Division,**

**Air Quality and Noise Management Division, Department of Environment, BMA**



**+66 2203 2955**



**[climatechange.bkk@gmail.com](mailto:climatechange.bkk@gmail.com)**





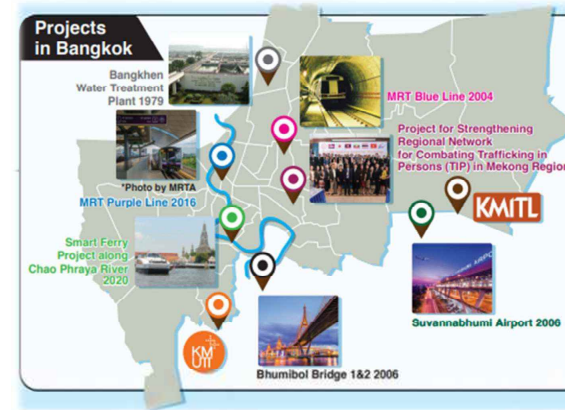
# Collaboration between BMA and JICA

## Current and Future

1. Current JICA Cooperation activities related to environment in Bangkok
2. Possible area for future cooperation
3. Others

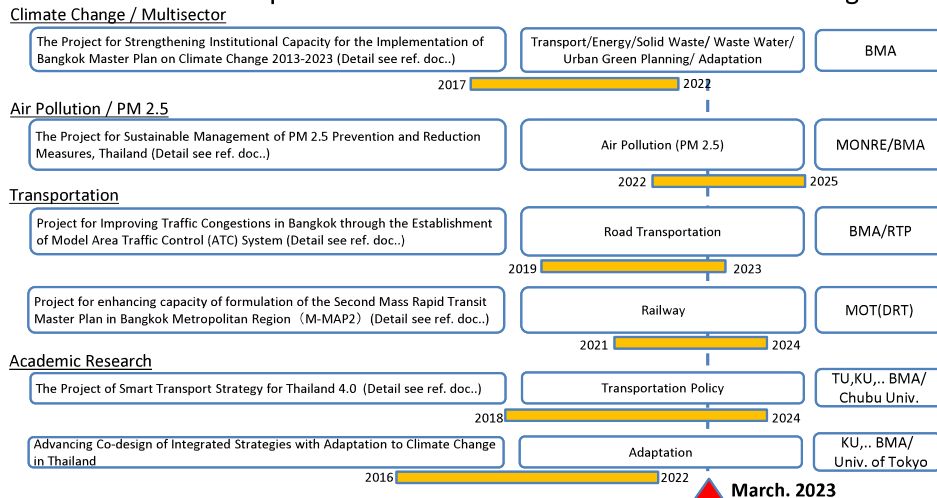
Kazuya Suzuki  
 Chief Representative  
 JICA Thailand Office  
 2<sup>nd</sup> March, 2023

## JICA's Projects in Bangkok Metropolitan Region



- 92% Water Production**  
Among the total water production for Bangkok, the rate of water produced by treatment plants assisted with JICA's cooperation
- 15 Bridges**  
Among 22 bridges over the Chaophraya River in Bangkok and vicinity, 15 were assisted with JICA's cooperation
- 39% Mass Rapid Transit (as of 2016)**  
Among all Mass Rapid Transit system distance in Bangkok, the rate of those assisted with JICA's cooperation

### 1. Current JICA Cooperation activities related to environment in Bangkok



### 1. JICA's Cooperation with the Bangkok Metropolitan Administration on climate change



## Bangkok Master Plan on Climate Change 2021 – 2030



**Vision 2030** : “Bangkok moves toward a green, livable and climate-resilient city, under the nationwide collaboration for sustainable development.”  
*Target to achieve 19% GHG emission reduction from BAU by 2030*

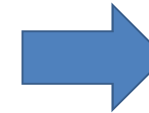
**Vision 2050** : “Bangkok as a livable and innovative city, pursuing efforts to achieve net-zero emissions and enhances resilience in all aspects.” *Long-term goal to achieve net-zero emission by 2050*

- Transport
- Energy
- Waste/Waste Water
- Urban Green Planning
- Adaptation



## Example of Knowledge sharing and Co-creation in the JICA cooperation

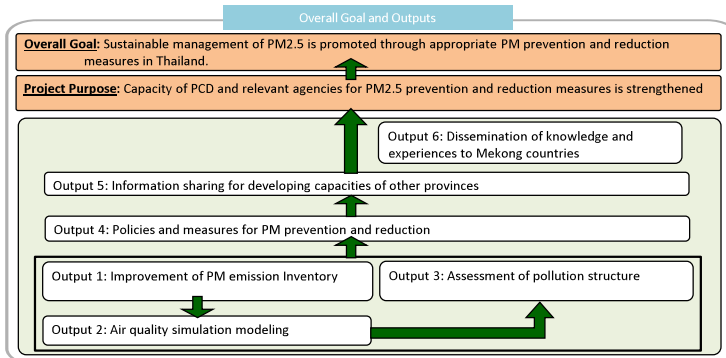
Good practice in Yokohama shared with BMA in the Training in Japan(2022.Sep)



BMA has introduced new waste collecting baskets in Sukhumvit Rd. to keep animals and birds away from the wastes as a result of training experience in Yokohama



## Project for Sustainable Management of PM2.5 Prevention and Reduction Measures



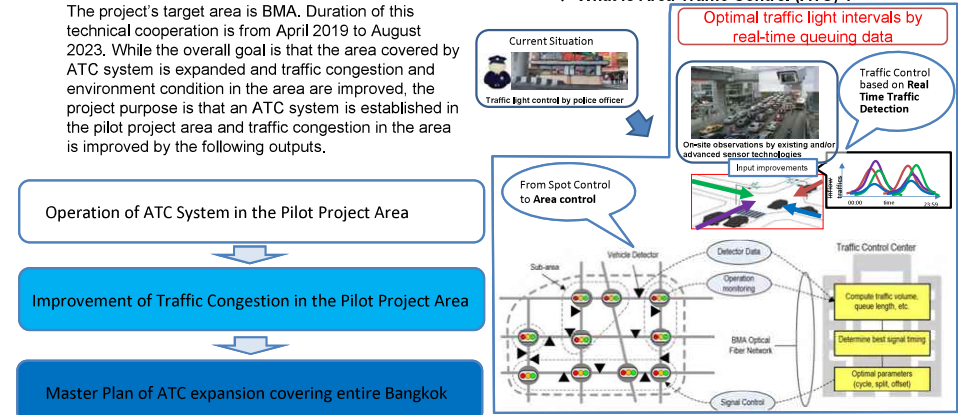
Project Duration	July 2022 to July 2025
Target Area	Bangkok Metropolitan Region (BMR) (Bangkok Metropolitan Administration, Nakhon Pathom, Pathum Thani, Nonthaburi, Samut Prakan, Samut Sakhon Provinces)
Relevant Organization	Pollution Control Department (PCD), Environment Bureau of BMA and 5 province offices, and MONRE provincial offices in BMR

## The Project for Improving Traffic Congestions in Bangkok Through the Establishment of Model Area Traffic Control (ATC) System in the Kingdom of Thailand

### ◆ Overview

The project's target area is BMA. Duration of this technical cooperation is from April 2019 to August 2023. While the overall goal is that the area covered by ATC system is expanded and traffic congestion and environment condition in the area are improved, the project purpose is that an ATC system is established in the pilot project area and traffic congestion in the area is improved by the following outputs.

### ◆ What is Area Traffic Control (ATC) ?



### JICA's Possible future actions with BMA

Climate Change  
PM2.5  
Traffic congestions

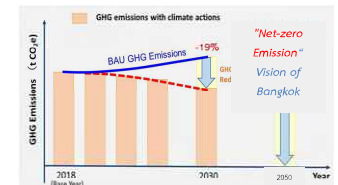


### JICA's future contribution for Bangkok Master Plan on Climate Change 2021 – 2030

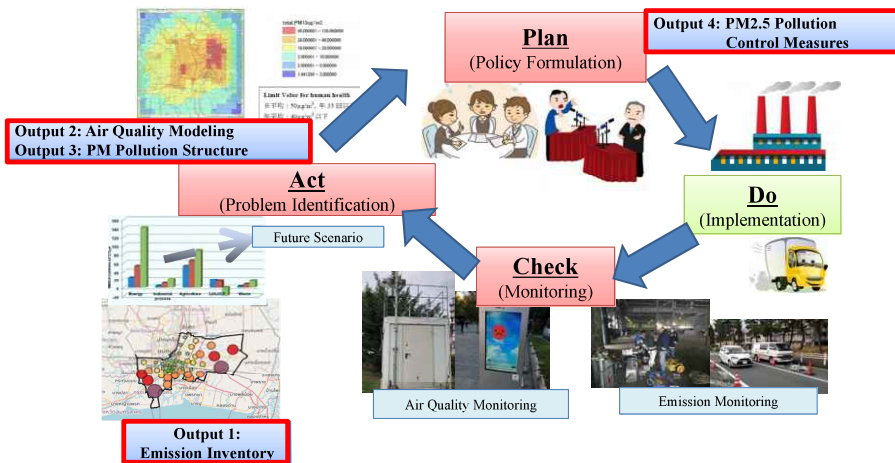


JICA will contribute to accelerate activities related to Climate Change in and around BMR.  
JICA will support to monitor implementation  
JICA will be a bridge between BMA and other institutes or organization to contribute realizing "Net-Zero Emission" Vision of Bangkok.

- Transport
- Energy
- Waste/Waste Water
- Urban Green Planning
- Adaptation



### Project for Sustainable Management of PM2.5 Prevention and Reduction Measures



### Plan of Operation in each Output

	2022	2023	2024	2025
Output 1: Emission Inventory				
Output 2: Air Quality Modeling				
Output 3: PM2.5 Pollution Structure				
Output 4: PM2.5 Pollution Reduction Measures				
Output 5: Sharing with other provinces				
Output 6: Knowledge and experience sharing with Mekong countries				



(Reference)  
**The Development of Environmental and Emission Standards of Volatile Organic Compounds (VOCs) 2006 - 2009**



Newspaper report the VOC air pollution



Monitoring activities

**Background**

- VOCs have been indicated as potentially having harmful effects such as headaches, dizziness, and kidney damage, as well as carcinogenic effects.
- the importance of initiating VOC monitoring and formulating environmental and emissions standards was recognized at the National Environment Committee (NEC) in January 2004, with the PCD being pressured to respond to the situation as well.
- VOCs: Volatile Organic Compounds**

**Project purpose:**  
 MONRE's capacity to take countermeasures against VOC's air pollution including development of environmental and emission standards in Thailand is enhanced

**Project outputs**

- Elucidation of the VOC air contamination status for setting up environmental and emissions standards.
- Proposal of environmental and emissions standards for VOCs to the Pollution Control Committee.

**partner country organization**  
 Pollution Control Department (PCD)

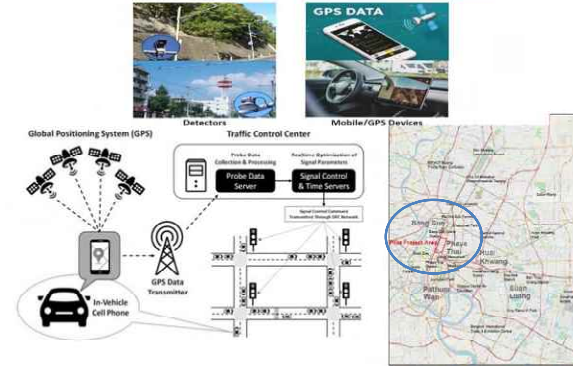
Thai government decided establishment of environment standard for 9 VOC components in Feb. 2007.  
 Its government decree became effective in Sep. 2007.

**The Project for Improving Traffic Congestions in Bangkok Through the Establishment of Model Area Traffic Control (ATC) System in the Kingdom of Thailand**

**Innovation: Cost Effective Traffic Control using Probe Data (Minimize installation of Roadside Sensors/Detectors)**

**Comparison of Detector and Mobile/GPS Data (Probe Data)**

Aspect	Roadside Sensors/Detectors	Mobile/GPS Devices
Installation cost	Expensive	Utilizing the existing resource
Maintenance	Needed	No
Coverage area	Spot	Area wide
Accuracy level	Accurate (if well set up)	Need to be studied



**Schedule**

- Start ATC pilot operation : June, 2023
- Probe data evaluation test : July, 2023

**Estimated CO2 Emission : -9% - 3% by micro simulation**

Hour	Item	Without ATC Case	
		BEFORE Existing Road Existing Green Time (by Manual Control)	AFTER Improved Road (Add Signal / Open U-Turn) Responsive Green Time by ATC System
Morning 7:30 - 9:30	F (gallons/PCU)	0.09	0.08
	CO (g/PCU)	6.17	5.80
	NOx (g/PCU)	1.20	1.13
Daytime 13:30 - 15:30	VOC (g/PCU)	1.43	1.34
	CO2 (g/PCU)	784.01	737.20
	F (gallons/PCU)	0.08	0.08
Evening 16:30 - 19:30	CO (g/PCU)	5.85	5.86
	NOx (g/PCU)	1.14	1.10
	VOC (g/PCU)	1.36	1.31
	CO2 (g/PCU)	743.58	720.01
	F (gallons/PCU)	0.09	0.08
	CO (g/PCU)	6.24	5.89
	NOx (g/PCU)	1.21	1.11
	VOC (g/PCU)	1.45	1.32
	CO2 (g/PCU)	793.33	722.95

**Summary**

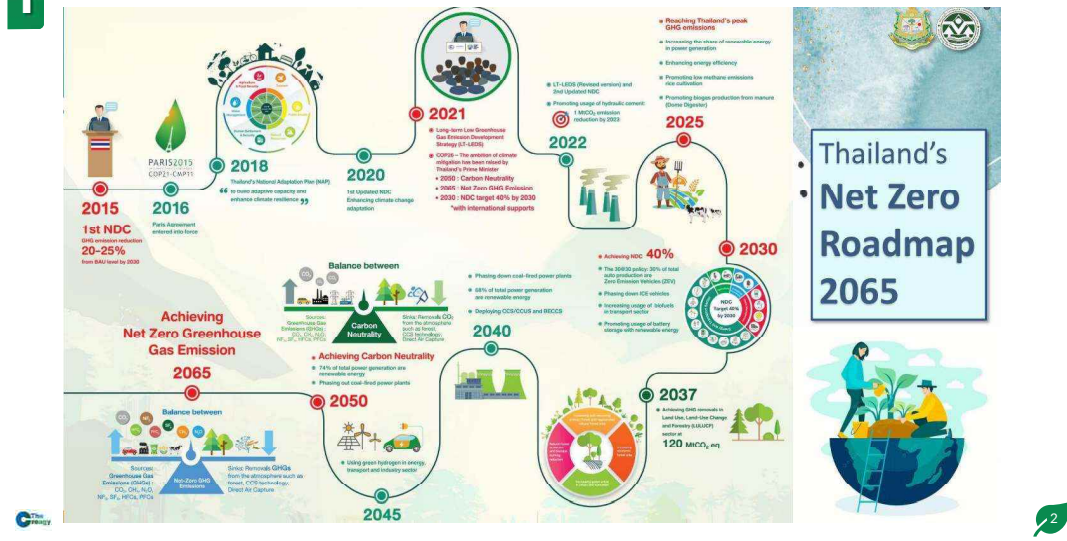
- ◆ To reduce influences caused by PM2.5  
 JICA contributes improvement of PM2.5 situation in Bangkok with scientific basis through the Project with PCD.  
 In 1<sup>st</sup> half of 2023, JICA will share its progress to BMA.
- ◆ To make "Action for Climate Empowerment"  
 JICA contributes to monitor activities to achieve Vision 2030, if necessity arises.  
 JICA makes bridges between BMA and partner organizations below;
  - International Organization (WB, ADB, etc.),
  - Private sector and Local governments in Japan.
- ◆ To achieve a Livable city Bangkok  
 JICA contributes to achieve "a Livable city" Bangkok through activities as below;
  - Finding appropriate way to reduce traffic congestion through ATC pilot project
  - Leading appropriate traffic mode change
  - Strengthening capability of traffic safety countermeasures



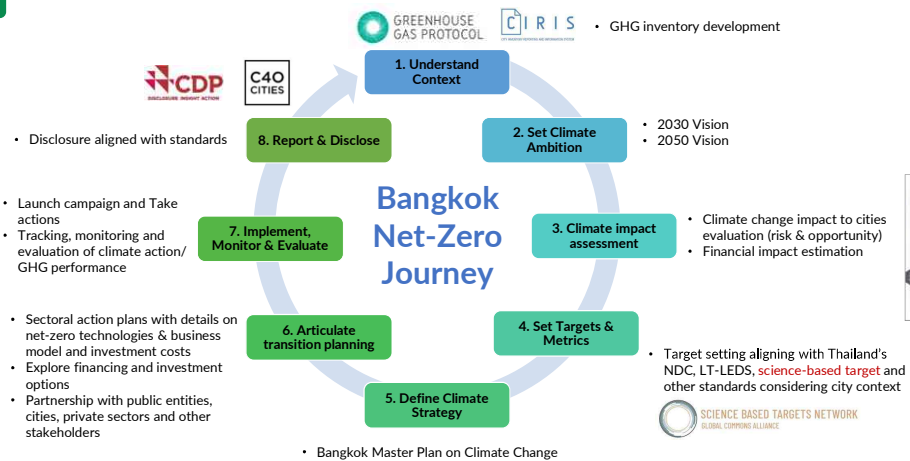
# Bangkok a pleasant city towards Net Zero Emissions



## Understand context: National roadmap



## Net-Zero Journey for Bangkok



## GHG Emissions inventory of Bangkok in 2018

Sector	Activity	GHG emissions (tCO <sub>2</sub> e)			
		Scope 1	Scope 2	Scope 3	Basic
I. Stationary Energy	All (I.) Combustion of Fuel (exclude energy generation)	4,653,111	21,570,934	NE	26,224,046
	Energy generation supplied to the grid (Fossil fuel)	287,671			
II. Transportation	All (II.) emissions	11,693,074	146,747	NE	11,839,821
	Generated within the city	879,061		4,785,100	5,664,161
III. Waste	Generated outside of the city	NO			
	Industrial processes	NO			
IV. IPPU	Product use	NE			
V. AFOLU	All (V.) emissions	NE			
Sum		17,512,918	21,717,682	4,785,100	43,728,028

■ Sources required for BASIC reporting  
■ + ■ Sources required for BASIC+ reporting  
■ Non-applicable emissions  
 NO = Not Occurring    IE = Included Elsewhere    NE = Not Estimated    C = Confidential

- Top 5 sub-activities are 1) on-road transportation, 2) energy use in commercial and institutional building and facilities, 3) energy use in manufacturing industries and construction, 4) energy use in residential buildings, and 5) solid waste disposal by landfill.
- GHG emissions from the top five largest are 96.79% of the total emission.

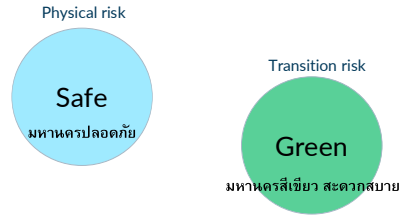


## Climate ambition & vision set up

Future Visions of Bangkok on Climate Change for 2030 and 2050

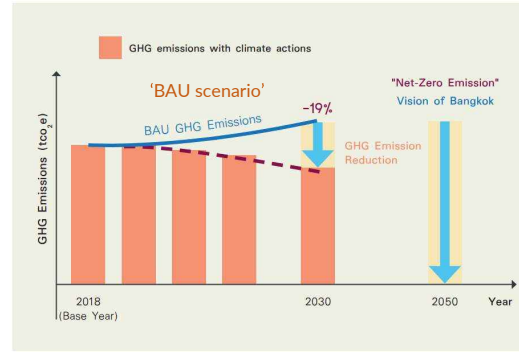
**Vision 2030**  
 "Bangkok moves toward a green, livable and climate-resilient city, under nationwide collaboration for sustainable development."

**Vision 2050**  
 "Bangkok as a livable and innovative city, pursuing efforts to achieve net-zero emissions and enhancing resilience in all aspects."



## Target/goal setting & Metrics

### GHG reduction (mitigation) Target



Bangkok's interim target by 2030 and long-term vision towards Net-zero emission by 2050

### Adaptation Goal

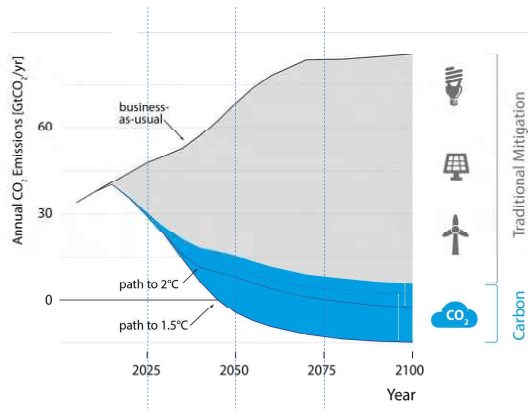
✓ Set goals and indicators to be in line with NAP sectors and have potential to encounter the climate risks

## The Bangkok Climate Change Master Plan is updated aiming toward Net-Zero-Emissions by 2050

### Outline of the Bangkok Master Plan on Climate Change

- Chapter 1: Background
- Chapter 2: Approach & Significance of Revising the MP
- Chapter 3: Future Visions of Bangkok
- Chapter 4: Bangkok's GHG Inventory and Trajectories
- Chapter 5: Mitigation actions
- Chapter 6: Climate risk assessment & Adaptation actions
- Chapter 7: Highlight measures under BMA assets
- Chapter 8: Progress management mechanism

## The challenge will not be easy, BMA's actions alone is not enough to deliver 1.5 or 2 degrees to become a pleasant city

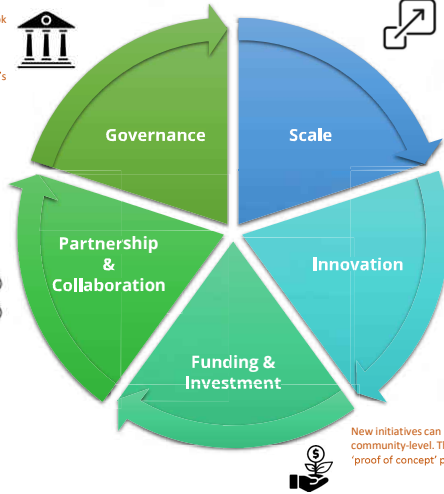


Collaboration with external partners and wider stakeholders will be crucial to deliver the further transitions necessary.



## There are many opportunities toward Bangkok's net-zero emissions

Taking net-zero actions require Bangkok to work with government to align policies, programs and funding. BMA can act as a link between Bangkok's ambition and higher-level government's targets



Bangkok's neighborhoods are big enough to provide economies and efficiencies of scale and provide additional opportunities from integration, compared with a single system- or sector-based approach



Neighborhoods provide an opportunity to experiment with innovative or novel city policies, design approaches or partnership arrangements before these are scaled up. This means that outcomes, challenges and opportunities are visible in a shorter period of time, and at a lower cost than a city-wide initiative.

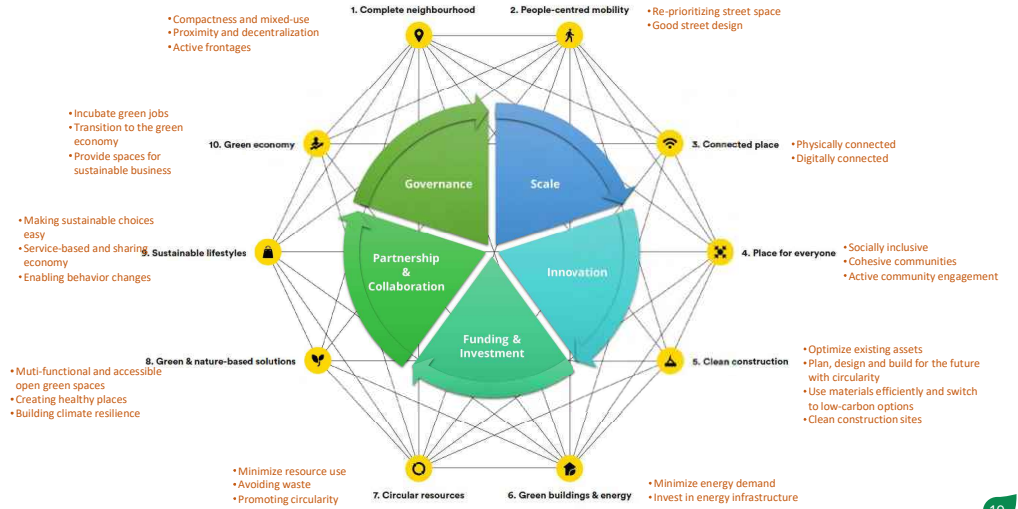


New initiatives can be initiated with a lower level of investment at the community-level. This provides an opportunity to design and deliver 'proof of concept' projects, which can attract further funding.

Implementing net zero solutions provides many opportunities for partnership & collaboration to the transition to behavior change and investment

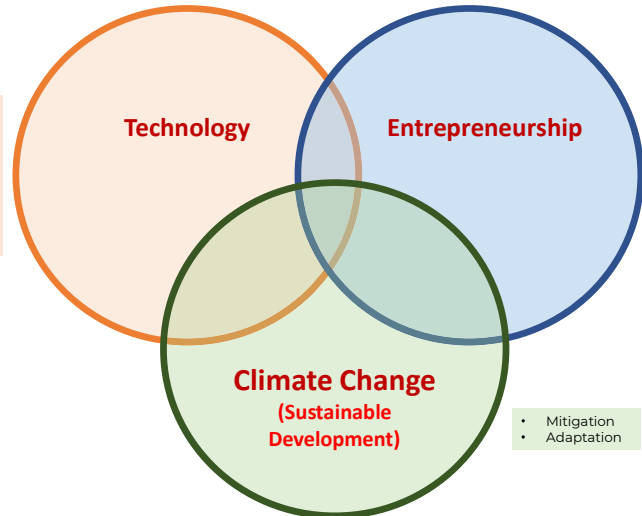


## Approaches to net-zero emissions for city



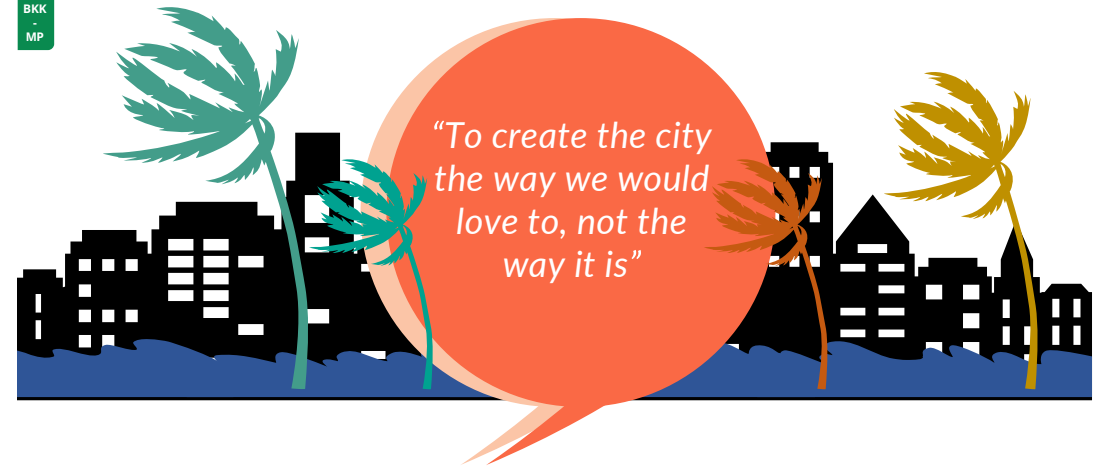
## This ambitious target will transform city to really become "Smart and Sustainability", creating quality jobs, technology and entrepreneurs in city.

- Digital technology
- Information technology
- Data Structure & Analysis
- Machine learning
- Artificial Intelligence



- Entrepreneurship Management and Social Enterprise
- Financial and Accounting Management
- Technology and Innovation Management
- Business Modeling and Digital Transformation
- Digital Operation Management

- Mitigation
- Adaptation



# Thank You!

Do you have any questions?

[Boonrod@thecreagy.com](mailto:Boonrod@thecreagy.com)  
[www.thecreagy.com](http://www.thecreagy.com)



## About me

- Climate geek with +20 yrs of exp. in clean energy & climate markets
- Love running, reading and exchanging new ideas
- Passionate to see our 'net-zero' world with my own eyes

## Current position

- Founder & Director at Creagy
- Instructor on Climate Change at Chulalongkorn School of Integrated Innovation (SCII)
- Council board at Thailand Carbon Neutral Network (TCNN)
- Board member at Energy Evaluation

## Previous experience

- USAID programs (Abt & Deloitte) Clean Energy Finance Team Leader
- Engie Asia (GDF SUEZ) Senior carbon business developer
- Eneco Energy Trade BV Commercial carbon structure
- ABM AMRO NV Sustainable Risk Advisor – climate
- ERM-Siam & San.E.68 Consultant on waste, energy and climate.

## Education

- B.Eng. Environmental Engineering from Chulalongkorn, Thailand
- M.Sc Sustainable Energy Engineering from KTH, Sweden
- Stockholm School of Entrepreneurship (SSES) alumni
- Scholar from the Global Sustainable Electricity Partnership
- CFA level II candidate.



**Boonrod Yaowapruerk (Tik)**  
[boonrod@thecreagy.com](mailto:boonrod@thecreagy.com)

A purpose-driven consultancy specialized in Climate Market

## Our mission is to build a Net-Zero Economy

We work with clients to **identify, prioritize, evaluate Risks & capture Opportunities** through data analysis, customized scenarios, tracking tools, decarbonization pathways & strategies, and implementation of strategic planning in the net-zero journey.

### Our Expertise

- Climate Strategy, Risk & Opportunity Assessment
- Business models & financial instruments design
- Data measurement, collection & analytics
- Policy, market and incentive design
- Monitoring & evaluation



Clean Energy



Clean Transport



Climate Change



Green Finance



Market Transition



# Thailand Voluntary Emission Reduction Program: T-VER



Thailand Greenhouse Gas Management Organization (Public Organization)

22 August 2022



## Thailand Voluntary Emission Reduction Program (T-VER)



### General Information of T-VER

- A domestic GHG mitigation mechanism,
- Aims to promote cooperation of all relevant sectors in GHG reduction,
- TGO has responsibility to define criteria, project development process, methodology, registration, and credit issuance.

### Objectives of T-VER

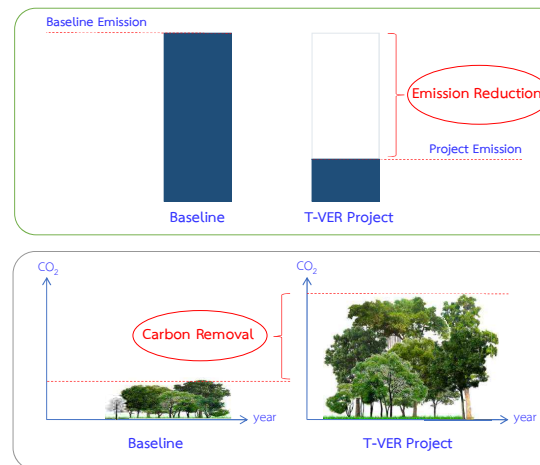
1. To promote participation for domestic voluntary GHG mitigation in Thailand,
2. To promote domestic carbon market,
3. To prepare readiness of all sectors in cope with GHG mitigation commitment.

## T-VER's Credit Reliability

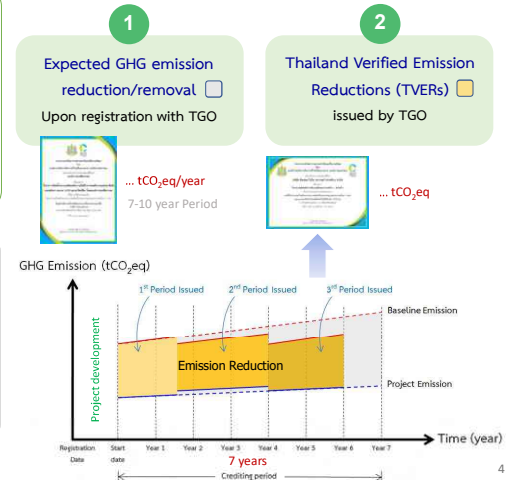
1. T-VER's framework is in correspondence with the ISO 14064-2, ISO 14064-2 specifies principles and requirements and provides guidance at the project level for quantification, monitoring and reporting of activities intended to cause greenhouse gas (GHG) emission reductions or removal enhancements.
2. Monitoring and Verification framework of GHG emission is also in correspondence with the ISO 14064-3, ISO 14064-3 specifies principles and requirements and provides guidance for those conducting or managing the validation and/or verification of greenhouse gas (GHG) assertions.
3. Validation and Verification Body (VVB) are registered by TGO.

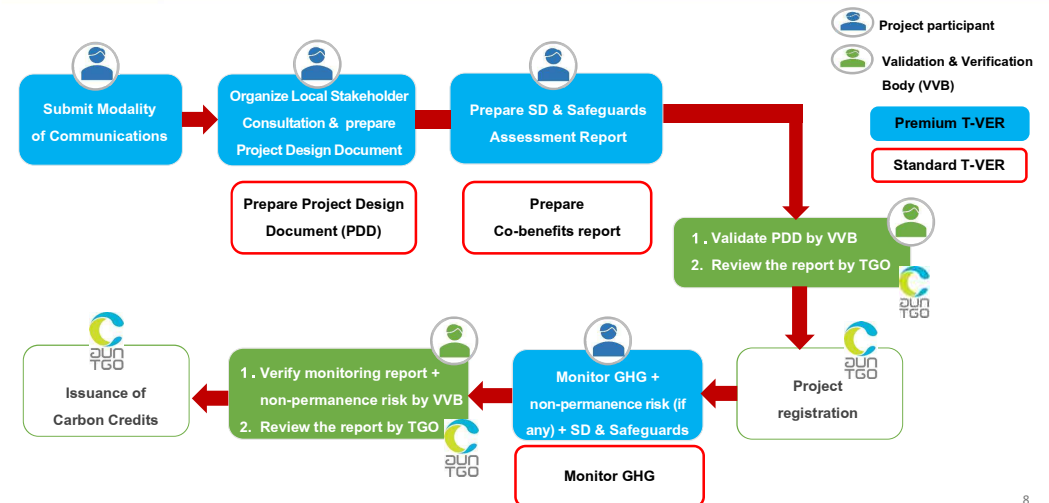
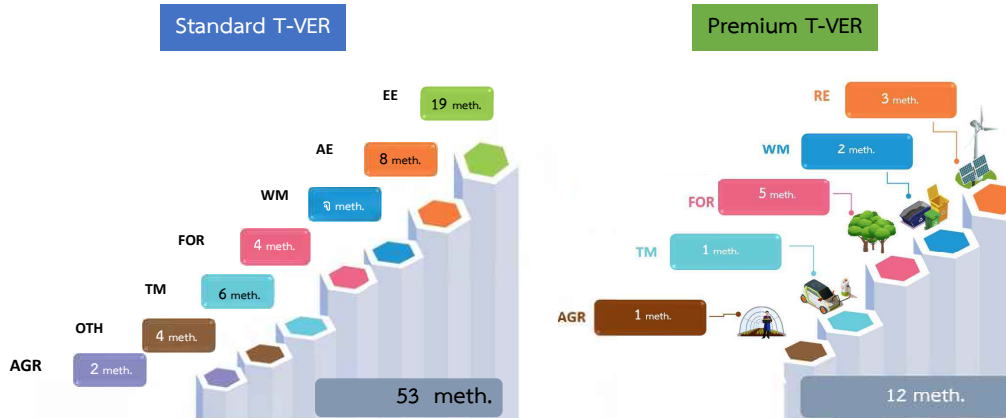
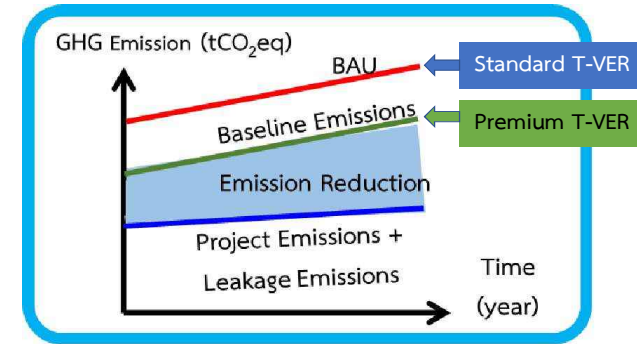
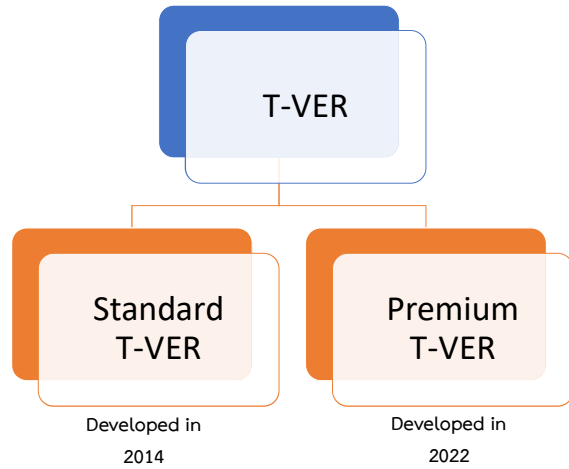


## Carbon Credits of T-VER

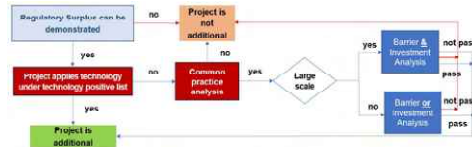


Emissions reduction/removal from projects situated in Thailand





- Additional** Guidelines for Demonstration of Project Additionality
- Public participation** Guidelines for Local Stakeholder Consultation
- Do no Net Harm with SDG Impacts** Guidelines for SD and Safeguards Assessment
- Permanent** Guidelines for Non-permanence Risk Assessment

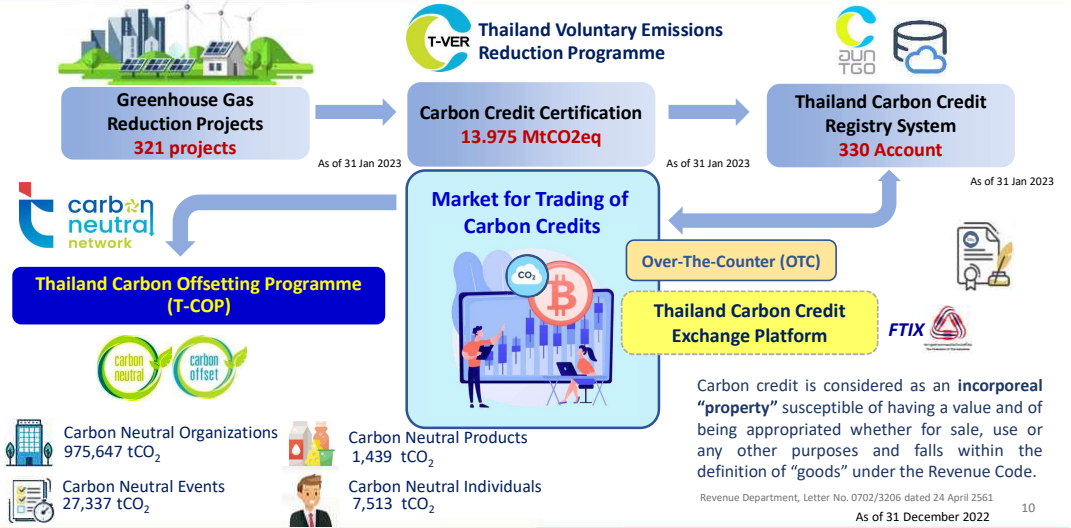


Project participant shall conduct a local stakeholder consultation including, informing the local stakeholder about the project details, calling for comments and input, participation in relevant problem solving and having a mutual agreement.

**Sustainable Development Goals: SDGs**

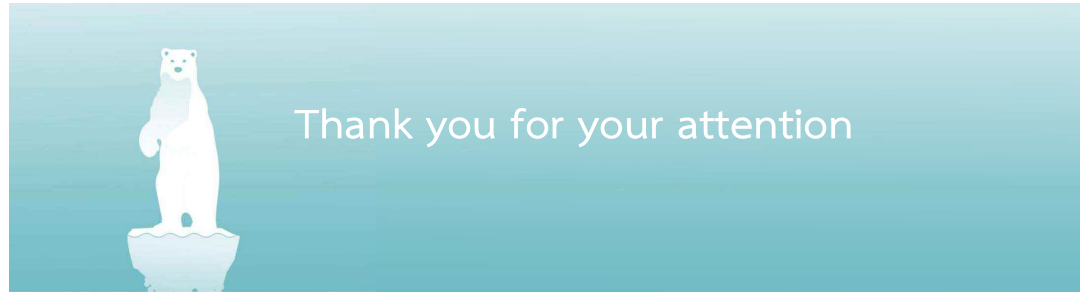
T-VER project shall contribute to more than 2 goals of SDGs.

If the project type is "Mitigation, absorption, and removal of greenhouse gases from forestry and the agricultural sector" or some sub-category type of "Capture, storage, and/or utilization of greenhouse gases", non-permanence risk shall be assessed, i.e. project administration, change of land ownership, forest fire, pest/disease outbreaks, other natural risks following the TGO's tool.



Carbon credit is considered as an incorporeal "property" susceptible of having a value and of being appropriated whether for sale, use or any other purposes and falls within the definition of "goods" under the Revenue Code.

Revenue Department, Letter No. 0702/3206 dated 24 April 2561



องค์การบริหารจัดการก๊าซเรือนกระจก (องค์การมหาชน)  
THAILAND GREENHOUSE GAS Management Organization  
(Public Organization)



120 หมู่ที่ 3 ชั้น 9 อาคารรัฐประศาสนภักดี  
ศูนย์ราชการเฉลิมพระเกียรติฯ ถนนแจ้งวัฒนะ  
แขวงทุ่งสองห้อง เขตหลักสี่ กรุงเทพมหานคร 10210 ประเทศไทย

SCAN ME

โทรศัพท์: 0 2141 9790  
โทรสาร: 0 2143 8400 อีเมล: info@tgo.or.th  
เว็บไซต์: http://www.tgo.or.th



ศูนย์ราชการเฉลิมพระเกียรติฯ ต. พญาไท อ. จตุจักร จ. กรุงเทพฯ 10210  
อาคารรัฐประศาสนภักดี ชั้น 9  
เลขที่ 120 หมู่ที่ 3 ถนนแจ้งวัฒนะ แขวงทุ่งสองห้อง เขตหลักสี่ กรุงเทพมหานคร 10210  
โทร 0 2141 9790 โทรสาร 0 2143 8400



# RENEWABLE ENERGY CERTIFICATE

**Pakawee Silpanon**

Head, Management and Promotion Greenhouse Gas Reduction Section  
Electricity Generating Authority of Thailand (EGAT)



## Energy Attribute Certificate: EAC



- US Renewable Energy Certificate Schemes (US REC, REC)
- Guarantee of Origin (GO)
- National System
- International REC Standard (I-REC)

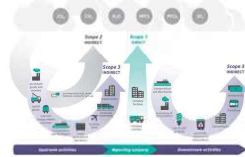
## The International REC Standard (I-REC)



1 REC  
Renewable Energy Certificate

=

1 MWh  
of clean energy

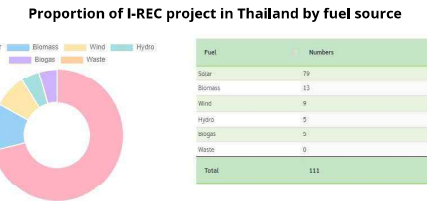
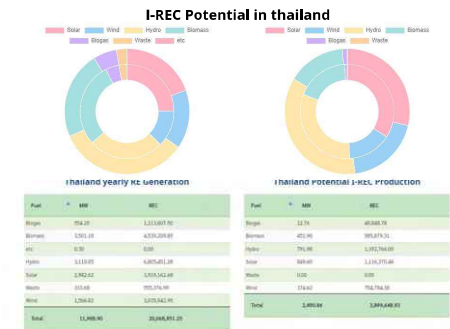


Carbon Emission Scopes	Carbon Credits	REC
Scope1- Direct Emission	✓	
Scope2- Indirect Emission	✓	✓
Scope3- Other Indirect Emission	✓	

How does REC support your "renewables journey"?



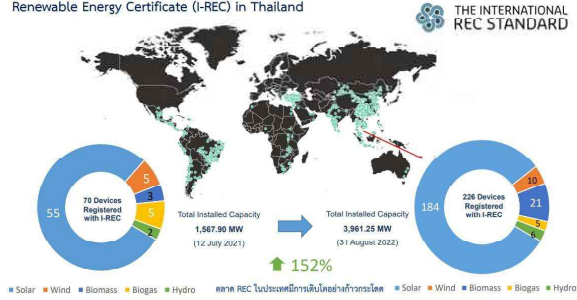
## Thailand Clean Energy Network (Y2020)



# Green Energy Demand Drives Innovation



## Renewable Energy Certificate (I-REC) in Thailand



**THANK YOU**



## 2<sup>nd</sup> Workshop on Net Zero Emissions Business Opportunity under Bangkok-Yokohama City-to-City Program

### Trends of carbon credit quality and corporate net zero claim

March 2, 2023

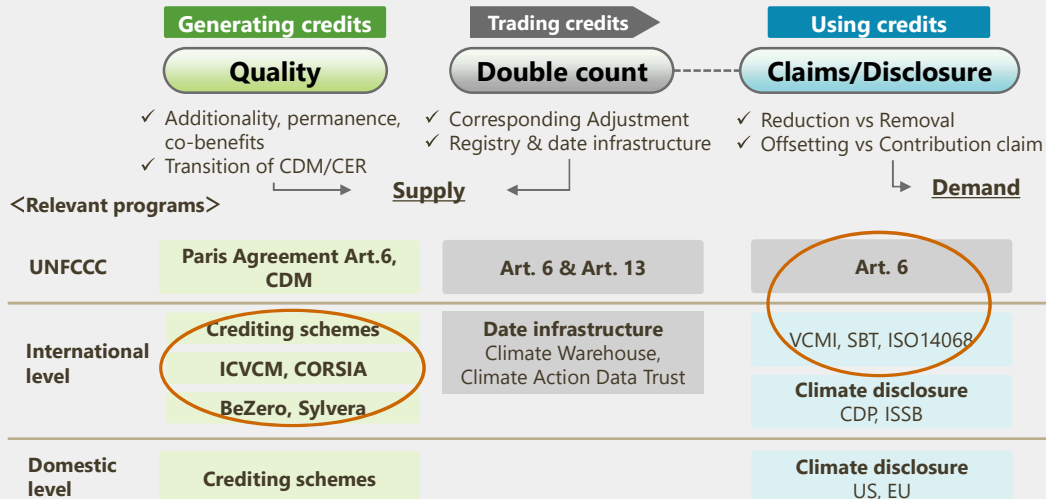
Overseas Environmental Cooperation Center, Japan (OECC)

Jun Watanabe

## Contents

1. Overview of issues in voluntary carbon markets
2. Trends of carbon credit quality
  - ◆ CORSIA, IC-VCM
  - ◆ Carbon credit ratings (BeZero, Sylvera, AlliedOffsets)
3. Trends of carbon credit claims by corporate
  - ◆ VCMI
  - ◆ SBTi
  - ◆ HLEG
  - ◆ IWA42, ISO14068

## 1. Overview of issues in voluntary carbon markets



## 2. Credit quality: Major quality factors

### **[Additionality]**

- ✓ "The greenhouse gas (GHG) emission reductions or removals from the mitigation activity shall be additional, i.e., they would not have occurred in the absence of the incentive created by carbon credit revenues." (Definition: IC-VCM draft CCPs)
- ✓ Additionality is assessed by analyzing Financial / Economic / Social / Regulatory barriers

### **[Credible baseline scenario]**

- ✓ "A description of the situation and the outcome that is predicted or assumed to occur in the absence of the incentives created by the carbon credits and their associated mitigation activities, while holding all other factors constant." (Definition: IC-VCM draft CCPs)
- ✓ If a baseline is underestimated, too much carbon credits will be issued than GHG reduction achieved by the project (Over-crediting)

### **[Permanence]**

- ✓ "The GHG emission reductions or removals from the mitigation activity shall be permanent, or if they have a risk of reversal, any reversals shall be fully compensated." (Definition: IC-VCM draft CCPs)
- ✓ There are challenges in emerging sectors such as forestry, agriculture and CCUS.

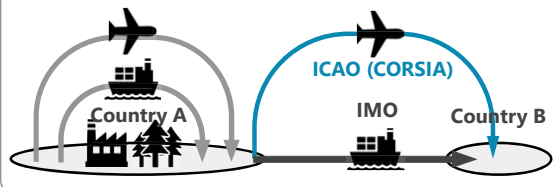
### **[Co-benefit]**

- ✓ Environmental and social benefits other than GHG mitigation such as SDG impacts and adaptation impacts.

## 2. Credit quality: CORSIA

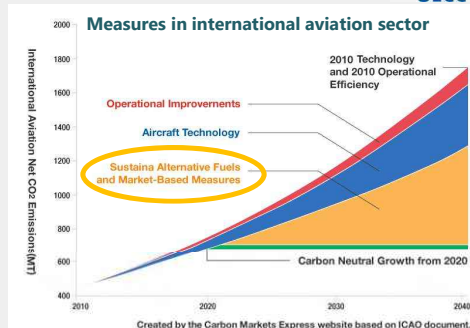
### [Demarcation of international climate measures]

UNFCCC /Paris Agreement



**CORSIA**

- ✓ 'Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)' was started from 2021 as market-based measure to offset increasing GHG emissions.
- ✓ Aircraft operators are required to purchase and retire **CORSIA Eligible Emissions Units (EEU)** to offset their CO<sub>2</sub> emissions based on allocated offsetting requirements.
- ✓ 107 countries have participated the pilot phase [2021-2023] of CORSIA. (as of 2022)



## 2. Credit quality: CORSIA Eligible Emissions Unit (EEU)

- ✓ Eligible carbon credits is assessed through **CORSIA Emissions Unit Criteria (EUC)**.

Program Design Elements	Credit Integrity Assessment Criteria
<ul style="list-style-type: none"> <li>☐ Clear Methodologies &amp; Protocols, &amp; their Development Process</li> <li>☐ Scope Considerations</li> <li>☐ Offset Credit Issuance and Retirement Procedures</li> <li>☐ Identification and Tracking</li> <li>☐ Legal Nature and Transfer of Units</li> <li>☐ Validation and Verification procedures</li> <li>☐ Program Governance</li> <li>☐ Transparency and Public Participation Provisions</li> <li>☐ Safeguards System</li> <li>☐ Sustainable Development Criteria</li> <li>☐ Avoidance of Double Counting, Issuance and Claiming</li> </ul>	<p><b>Additional</b></p> <p><b>Based on a realistic and credible baseline</b></p> <p>Quantified, monitored, reported, and verified</p> <p>Clear and transparent chain of custody</p> <p><b>Permanent emissions reductions</b></p> <p>Assess &amp; mitigate emissions elsewhere (leakage)</p> <p>Only counted once</p> <p><b>Do no net harm</b></p>

- ✓ Technical Advisory Body (TAB) approves **CORSIA Eligible Emissions Unit (EEU)** based on EUC.

American Carbon Registry (ACR)	Forest Carbon Partnership Facility (FCPF)
Architecture for REDD+ Transactions (ART)	Global Carbon Council (GCC)
China GHG Voluntary Emission Reduction Program	The Gold Standard (GS)
Clean Development Mechanism (CDM)	Verified Carbon Standard (VCS)
Climate Action Reserve (CAR)	*Only certain methodologies are approved as EEU.

## 2. Credit quality: IC-VCM

### The Integrity Council for the Voluntary Carbon Market (IC-VCM)

- ☐ IC-VCM is a governance body developing 'Core Carbon Principles (CCP)', which will set new threshold standards for high-quality carbon credit and labeling CCP-eligible carbon-crediting programs and methodologies
- ☐ Draft CCP was released in July 2022 and planned to be finalized in March 2023. Labeling may be started in Q3 2023.

#### (Draft) Core Carbon Principles (CCP)

- ◆ **Additionality**
- ◆ Mitigation activity information
- ◆ No double counting
- ◆ **Permanence**
- ◆ Program governance
- ◆ Registry
- ◆ Robust independent third-party validation & verification
- ◆ Robust quantification of emission reductions and removals
- ◆ **Sustainable development impacts and safeguards**
- ◆ **Transition towards net-zero emissions**

#### (Draft) Attributes of carbon credits

- (Information tagged with Carbon credit)
- ◆ Type of mitigation activity (Reduction/Removal)
  - ◆ Authorisation for Article 6 purposes (ITMOs)
  - ◆ **Quantified SDG impacts**
  - ◆ **Adaptation co-benefits**

## 2. Credit quality: Carbon credit ratings

### BeZero Carbon

- ✓ Established in UK in 2020, providing carbon project rating service including over 280 projects.
- ✓ Assessing likelihood of achieving 1 tCO<sub>2</sub>e reduction/removal in 7 grades: A/AA-/AA/AA+/AAA-/AAA/AAA+
- ✓ Analyzing 6 critical risk factors: **1. Additionality, 2. Over-crediting, 3. Non-permanence, 4. Leakage, 5. Perverse Incentives, 6. Policy**
- ✓ Basic rating information are publicly available free of charge
- ✓ Linking with carbon trading platforms to provide rating information for credits on sale. e.g. CBL Xpansiv platform, AirCarbon Xchange, Salesforce's Net Zero Marketplace, Patch

Rating	Name	Vintage	Accreditor	Project ID	Sub-sector	Location
AA-	Akinci Hydroelectric Power Plant	24/10/18 - 30/09/21	VCS	1380	Renewables	Turkey

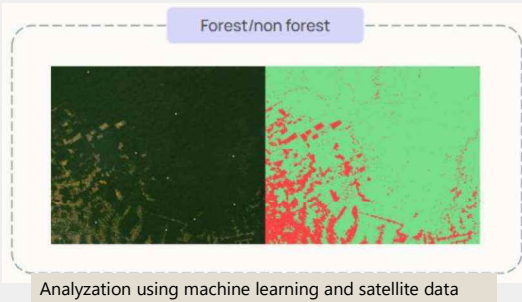
'AA-' rating continues to reflect our view that evidence concerning the favourable conditions for investing in hydropower in Turkey, relatively low costs and high penetration all indicate **low additionality**. However, the rating is bolstered by **small relative risks of over-crediting**. (Source: BeZero webpage)

## 2. Credit quality: Carbon credit ratings



### Sylvera

- ✓ Established in 2019, providing carbon project rating service on mainly REDD+ project currently.
- ✓ Assessing likelihood of achieving 1 tCO<sub>2</sub>e reduction/removal in 8 grades: D/C/B/BB/BBB/A/AA/AAA
- ✓ Evaluating 3 scoring pillars: 1. Carbon score, 2. Additionality, 3. Permanence, and Co-benefits
- ✓ Linking with carbon trading platforms to provide rating information for credits on sale. e.g. CBL Xpansiv platform, Climate Impact X, Salesforce's Net Zero Marketplace



## 2. Credit quality: Carbon credit ratings



### AlliedOffsets

- ✓ Based in UK, providing database of 20,000+ carbon projects and market analysis.
- ✓ Database covers many crediting programs: Acorn, American Carbon Registry, Architecture for REDD+ Transactions, Climate Action Reserve, Clean Development Mechanism, Gold Standard, Label Bas Carbone, Nori, ProClima/BioCarbon Registry, Puro.earth, Verra
- ✓ Linking with external credit quality rating services including Japanese startup, sutainacraft.



## 2. Credit quality: Corporate approaches



Shell employs a rigorous internal screening process that looks at the following criteria:

- ✓ The approved carbon standard
- ✓ Environmental impacts beyond CO<sub>2</sub>
- ✓ Societal benefits for the local community
- ✓ Project developer competency
- ✓ Government support
- ✓ Reputational risks

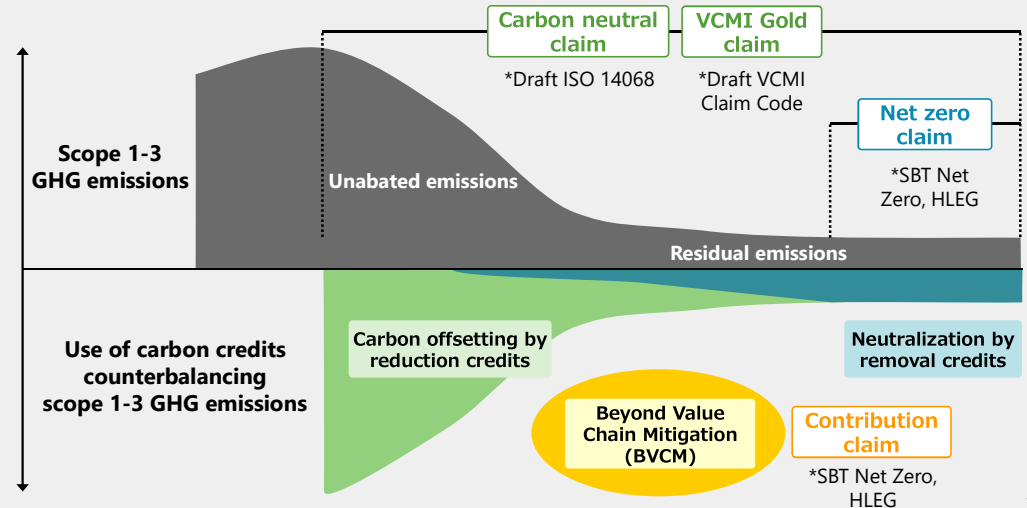
shopify

How did we choose our carbon offset provider?

- Additionality
- Permanence
- No double-counting
- Monitoring and verification

- Registered under an internationally recognised standard that indepe carbon offset standards for compliance offsets.
- Adheres to a robust emission reduction accounting methodology to
- Demonstrates that the emissions reductions are additional to ensure offset market.
- Has a high likelihood of permanence to ensure the emissions reductio trees are not cut down or destroyed by a natural disaster).
- Provides robust mitigation against leakage ensuring an offsetting pro deforestation through offsetting but another forest area is destroyed).
- Demonstrates high environmental and social integrity ensuring no b forest clearing and community displacement).
- Restrict early vintage years to avoid claiming emissions reduction fro purchasing offsets with a vintage greater than five years

## 3. carbon credit claims: Type of claims





### 3. carbon credit claims: VCMi



#### Voluntary Carbon Market Initiative (VCMi) \*Since July 2021

- ❑ Co-funded by the Children's Investment Fund Foundation (CIFF) and the UK government.
- ❑ Developing guidance on voluntary use of carbon credit 'VCMi Code of Practice'
- ❑ Draft code was published in June 2022 and will be revised through road test till June 2023.



#### 4 steps for making credible claims

- ① **Meet prerequisites:** Net zero commitment by 2050, interim targets, information on plans and strategies
- ② **Identify claim to make:** Enterprise-wide claims (Gold/Silver/Bronze) or Brand/Product/Service level claim
- ③ **Purchasing high-quality credits:** CORSIA & IC-VCM may provide quality criteria for carbon credits
- ④ **Report transparently on the Use of Carbon Credits:** Credits retired, project, vintage, methodology etc.

Criteria	VCMi Gold: Net Zero	VCMi Silver	VCMi Bronze (2030年まで利用可能)
Interim targets	On track to achieve target for scope 1-3	On track to achieve target for scope 1-3	On track to achieve target for scope 1-2 & maximum 50% credits to achieve scope 3
Credits	100% of unabated emission	<20% of unabated emission	<20% of unabated emission

### 3. carbon credit claims: SBTi, HLEG



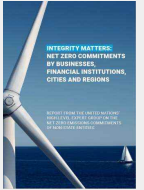
#### Science Based Targets initiative (SBTi): Corporate Net-Zero Standard [Oct. 2021]

- ❑ Providing guidance for corporates setting net-zero targets in line with 1.5°C pathway.
- ❑ Companies should set near- & long-term targets and reducing GHG under the hierarchy approach which prioritize value chain mitigation.
- ✓ **Must neutralize residual emissions through removal of carbon (incl. credits).**
- ✓ **Should mitigate emissions beyond value chains (BVCM) (incl. credits).**



#### Report from the United Nations' High-Level Expert Group on The Net Zero Emissions Commitments of Non-State Entities [2022/11/8]

- ❑ Expert group appointed by the UN Secretary General in Mar. 2022
- ❑ Providing recommendations for credible net zero pledge including setting 1.5°C-aligned near- & long-term targets, creating transition plan, and using credits.
- ✓ **Removal credits can be used to counterbalance unabated emissions.**
- ✓ **Credits should be used for beyond value chain mitigation (BVCM).**



### 3. carbon credit claims: IWA42, ISO14068



#### International Workshop Agreement IWA 42: Net zero guidelines [2022/11/11]

- ❑ Workshop based on voluntary participation proposed by UK in July 2022.
- ❑ Providing guiding principles and recommendations on net zero approach including 1.5°C-aligned target setting, mitigation planning, and prioritization of actions.
- ✓ **Residual emissions should be counterbalanced by carbon removal (incl. credits)**
- ✓ **Organizations with the capacity should promote targets and mitigations beyond the value chain (BVCM).**



#### ISO: 14068 Carbon Neutrality [To be published in 2023]

- ❑ Launched in Mar. 2020 and published a draft in Jan. 2023.
- ❑ Providing requirements and guidance for achieving and demonstrating carbon neutrality of organizations and products through the hierarchy approach.
- ✓ **Early phase: Unabated emissions to be counterbalanced by any type of credits.**
- ✓ **Later phase: Residual emissions to be counterbalanced by removal credits.**



### Summary



#### carbon credit quality

- ❑ Quality of carbon credits depends on:
  - Crediting program / Methodology / Vintage / Country**
- ❑ Quality is assessed by **factors** such as additionality, permanence, co-benefits etc.
- ❑ There are needs for **third party certifications and ratings** on high-quality credits.

#### carbon credit claim

- ❑ Many initiatives are developing rules and guidance regarding carbon credit claim.
- ❑ Different approaches of using carbon credits
  1. Carbon offsetting by reduction and removal credits
  2. Neutralization by removal credits
  3. Beyond Value Chain Mitigation (BVCM)
- ❑ Different types of claims:
  1. Net Zero
  2. Carbon Neutral



**Thank you for your attention!**

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**Overseas Environmental Cooperation Center, Japan (OECC)**

TEL : 03-5812-4104 FAX : 03-5812-4105

Website: <https://www.oecc.or.jp/>

Email: [watanabe@oecc.or.jp](mailto:watanabe@oecc.or.jp)

# SENA DEVELOPMENT

2023 Sustainability

Net Zero Emissions Business Opportunity under Bangkok-Yokohama City-to-City Program

2 March 2023 | Mandarin Hotel, Bangrak, Bangkok

SENA Development Public Company Limited



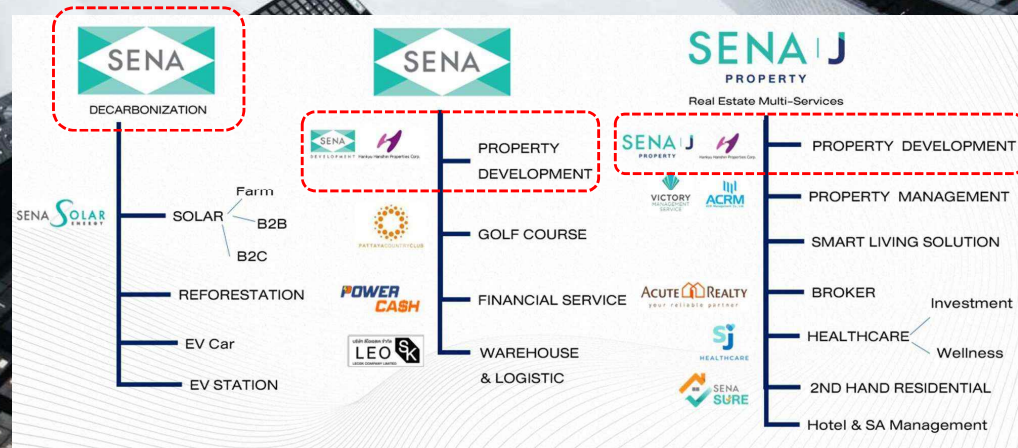
“A REAL ESTATE DEVELOPER TURNS AN ESSENTIAL LIFELONG TRUSTED PARTNER.”

EMPLOYING CORE COMPETENCIES FROM ALMOST FIVE DECADES IN PROPERTY DEVELOPMENT.

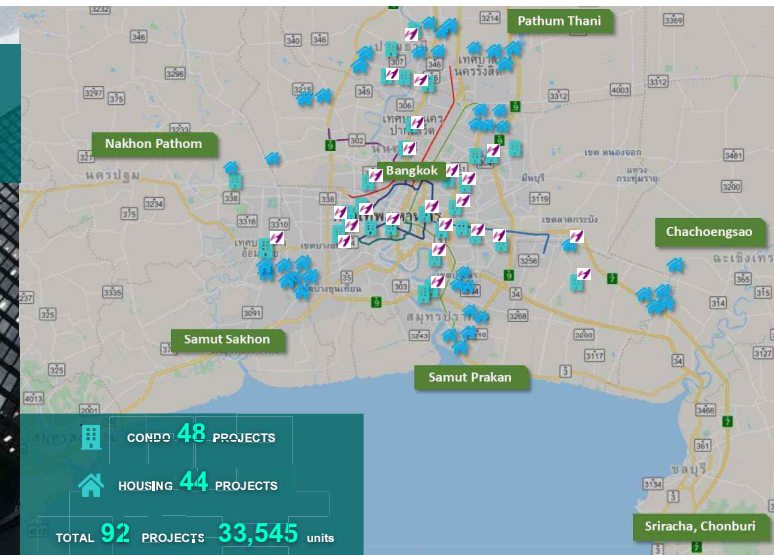
CORE BUSINESS GROWTH GROUNDED ON FORESEEN SOCIAL CHALLENGES FACING PEOPLE ON EVERY LEVEL OF COMMUNITY, CITY, COUNTRY, AND THE WORLD.

- THE OPPORTUNITY IS LIMITLESS -

## SENA GROUP COMPANY STRUCTURE



## PROJECTS



Over 51 Project (25,223 units) are the joint Venture Projects with HANKYU HANSHIN PROPERTIES CORP.

## STRONG STRATEGIC PARTNER

SENA & HANKYU JOINT VENTURE PROJECTS



PITI SUKHUMVIT 101 | NICHE PRIDE TACPOON INTERCHANGE | NICHE MONO RAMKHAMHAENG | NICHE MONO MEGASPACE BANGNA | NICHE MONO SUKHUMVIT BEARING | NICHE MONO CHARDENNAKHON | NICHE MONO CHAENGWATTANA | NICHE MONO ITSARAPAP | NICHE MONO RAMA 9



FLEM SATORN CHARDENNAKHON | FLEM TACPOON INTERCHANGE | SENALITH BANGNA RM 29 | SENALITH BTS SAPHANNAI | SENALITH WESTGATE BANGLATHONG | SENALITH THEPHARAK BANGBO | SENALITH RANGSIT THANON | SENALITH SRINAKARIN SIRIDAN



SENA VELA THEPHARAK BANGBO | SENALITH SRINAKARIN SIRIDAN

"Up to Now, The joint Venture Projects with HANKYU HANSHIN PROPERTIES CORP. are..."

OVER **51** PROJECTS | APPROXIMATELY **60,000** MB.



## RENEWABLE ENERGY : SOLAR for RESIDENTIAL



Add on provide Solar

We continue our intention to promote the clean energy use through the projects we developed in over....

CONDOMINIUM **18** PROJECT **360** KW.  
HOUSING **700** UNITS **2,000** KW.

- We are not only building house, we are building one with sustainability idea as a direction.
- We are the first developer in Thailand who brought Solar to the residential projects in full scale.
- We are the number 1 in Thailand who apply Government project "Rooftop solar power generation project for the public sector, Residential-housing type (โซลาร์ภาคประชาชน)" for solar energy selling back from customer to Government
- And Now We are working on "P2P Solar Sharing Project" Private net metering of Solar Rooftop for SENALITH Houses.



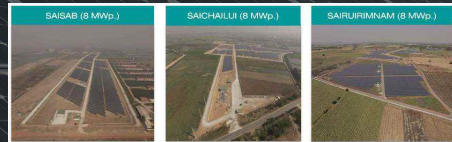
## RENEWABLE ENERGY : SOLAR FARM and SOLAR COMMERCIAL

### Solar Farm

Province : SARABURI (22.5 MWp.)



Province : NAKORNPATHOM (24 MWp.)



### Solar Commercial

PARADISE PARK Installation total 592 kWp.



Installation for 9 branches total 189.48 kWp.



Installation total 30.72 kWp.



### Solar Farm

**6** Site **46,500** KW.

### Solar Commercial

**40** Projects **11,500** KW.



## SENA Solar Energy TODAY

- Solar Farm  
6 Site 46,500 kW



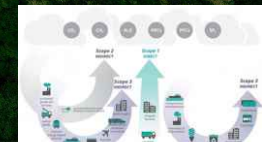
- Solar Roof

Rooftop solar power generation project for Residential (> 700 House, > 18 Condo) and Commercial (> 40 Projects)



## SENA Decarbonization TO BE

- Solar and More++
- Part of ECO System in EV Car  
E.g. EV Station, EV Car
- Using Expertise in Land Selection  
Big Land Lord → Forest



# ZERO ENERGY HOUSE ZEH Philosophy by SENA

**Electricity use** - **Cool house design** - **Energy saving materials** + **Clean energy production** = **0 Energy usage**

**INTEGRATED PROCESS**

Passive Design Strategies: Integrate passive design strategies into the design of a building without the need for purchased energy to keep buildings comfortable.

Active Design Strategies: Use purchased energy to keep the building comfortable.

**NET ZERO ENERGY HOUSE**

**ZEH House (Energy Saving)**

**DAYLIGHT SENSOR**

1. Building improvement teams  
2. Solar cell saving to achieve "ZEH"  
Electric bill saving

# FROM... SENA CUSTOMER... TO...

**SENA IN SOLAR BUSINESS**

- All SENA products are bundled with PV system
- SENA Inverter and Transformer with solar roof
- Solar roof in concrete type
- Not a stock at the stock of all construction projects

**FROM NOW ON, WE WILL CONTINUOUSLY DEVELOP OUR PRODUCT TO...**

- Energy Saving
- Electric Bill Saving
- Reduce Fossil Energy
- Reduce Carbon Emission

**“ZEH”**

**ZERO ENERGY HOUSING**

**Chula**  
Chulalongkorn University

The Professional Knowledge from the Historical University

**Panasonic**

The Technology from the Top-rank Japanese Company

**SENA DEVELOPMENT**

**Collaboration**

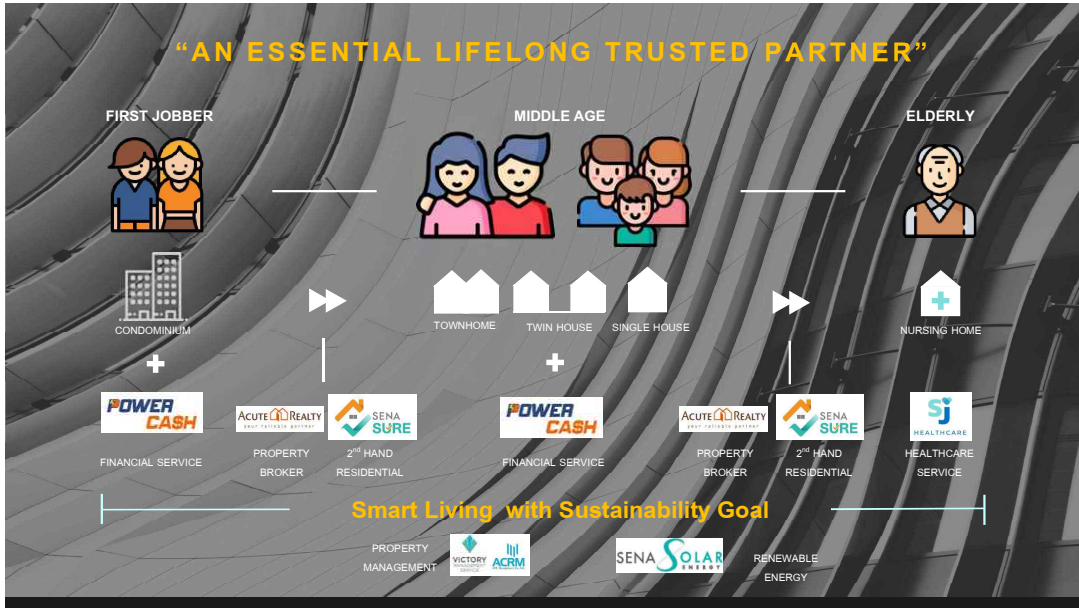
**Aiming for Sustainable Society and Thai people New Lifestyle**

- ✓ Stress-Free Environment for Living
- ✓ Well-being Environment for Living

**SENA SOLAR ENERGY** X **SHIZEN INTERNATIONAL**

**Sena Solar Joins Forces with Japanese Partner Shizen to Invest in Expanding Solar Business to Capitalize on the Global Energy Trend**

Asst. Prof. Dr. Kessara Thanyalakpark, Chief Executive Officer of Sena Solar Energy Co., Ltd., a pioneer in the Thai solar energy sector with extensive experience and expertise along with Mr. Oliver Center, Director and Chief Financial Officer of Shizen International Inc, the parent company of Shizen International (Thailand), which invests in and develops high-quality renewable energy generation and storage in Japan and other countries, have signed a memorandum of partnership to invest and explore the potential for expanding the renewable energy market in Thailand and will apply clean energy solutions to the government and private sector as well as solar farms in the future. Both companies recognize sustainable business development along with renewable energy to save the world, environment and society.



## PROPERTY MANAGEMENT BUSINESS

ACRM Management Co., Ltd.

Focus on NON-SENA property

VICTORY MANAGEMENT SERVICE

Focus on SENNA property

**We aim to make your home an ideal place for SMART LIVING**  
 For Example ; Telemed for primary care, Healthcare at home, Convenient living

**Traditional Business of Property Management**  
 Is to taking care of "Property" by mainly using human with some helps of APP to manage only Juristic works

```

  graph LR
    A[Property Management Company] -- B2B --> B[Juristic]
    B -- Group --> C[Customers]
  
```

**SMART LIVING**  
 Business of Property Management by mainly using Platform with some help of human deep down to Customer need by person

```

  graph LR
    A[Property Management Company] -- B2B --> B[Juristic]
    B -- Group --> C[Customers]
    C -- Personal Living, Life Style, Financial Service, Health Service --> A
  
```

2025 TOTAL PROJECT **168** PROJECTS

Current Residents in our property management +30,000 #11

TOTAL CURRENT PROJECT (IN CHARGED)

**97** PROJECTS

- VICTORY SERVICE: 72 PROJECTS
- ACRM: 25 PROJECTS

NEC Corporation (Thailand) Ltd.

### The Absolute Service : Pre-sales to After-sales

**SENA 360 App.**

*The Absolute Service*

SENA Development Public Company Limited | <https://www.sena.co.th/en/>

448 Ratchadapisek Road, Samsenok Sub-district, Huaikwang District Bangkok, Thailand 10310

2519 - 2565

**E@**  
Energy Absolute

# CHANGE FOR THE FUTURE

DIESEL ←-----→ NGV ←-----→ EV

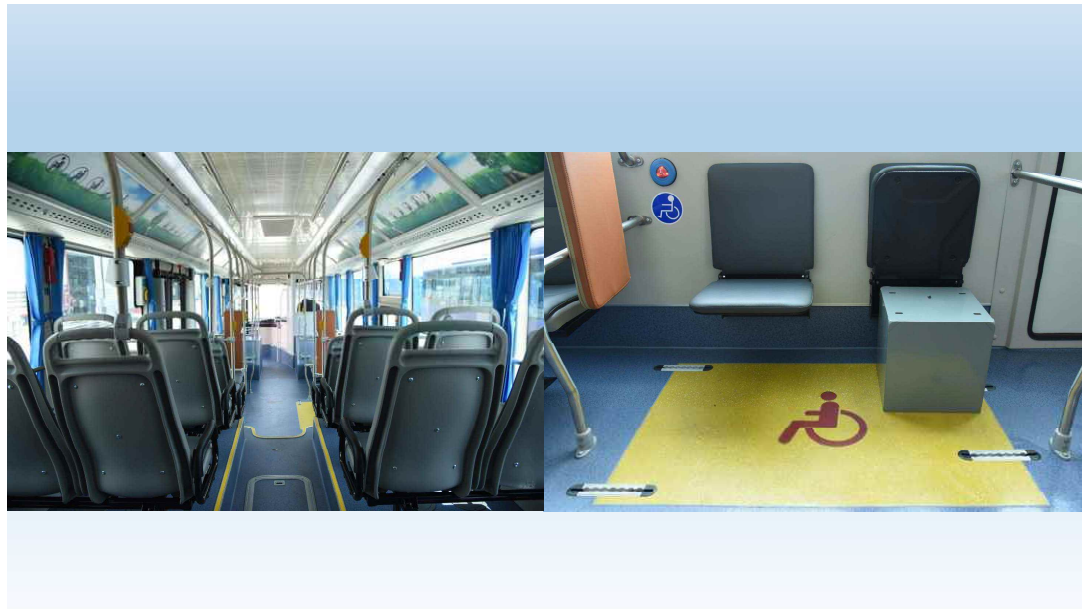
Norasak Suphakornthanakit  
AVP, Strategy Development and Investment Planning  
Energy Absolute Public Company Limited

## Several Benefits of EV

- Cheaper Maintenance
- Reasonable Fare price
- Reduce Emissions
- Reduce Noise
- Reduce PM 2.5

# CHANGE FOR THE FUTURE

FRIENDLY DESIGN





# ไทย-สวีเดน ลงนาม “โอนถ่ายคาร์บอนเครดิต” คู่แรกโลก

COP26 ( Article 6.2 of the Paris Agreement)



## โครงการซื้อขาย Carbon Credit

จากโครงการ EV-BUS ของประเทศไทย-สวีเดน



EV Bus Carbon Credit Project - EA and Klik Foundation


### Fuel switch


Emission reduction from replacement from ICE buses to EV buses

### Modal Shift


Emission reduction from change of behavior due to the EV bus project


จำนวนเบื้องต้น **500,000 tons** ภายในปี 2030







2,000 ICE buses replacement







159,237 tCo2 reduction per year





132,698 Rais of forest plantation





368x of Lumpini park



# EXIM Bank's Climate Finance for Sustainable Export

2 March 2023

**Mr. Ittipol Lertsakthanakul**  
Executive Vice President  
Export – Import Bank of Thailand



## Climate change is attacking Thai exporters and supply chains

Climate Change ≠ CSR = Trade Barrier



$$GDP = (X - M) + C + I + G$$



12 Years

2023 → 2035 : EU bans ICE car

### Top 10 Export Products of Thailand 2022

- |                               |                               |
|-------------------------------|-------------------------------|
| 1. Automobile and parts       | 6. Fuel oil                   |
| 2. Computer and parts         | 7. Chemical                   |
| 3. Gems and jewelry           | 8. Semiconductor              |
| 4. Rubber and rubber products | 9. Machinery and parts        |
| 5. Plastic resin              | 10. Air conditioner and parts |

Source : Ministry of Commerce



## EXIM Bank is decarbonizing Thai export and investment

### Long history of being the first mover

- Be a pioneer in financing solar farms in Thailand
  - Be the first Thai bank to help support Thai RE projects across this region e.g. Japan and Vietnam
- To build confidence for Thai commercial banks to step in

**Present and Future**  
Be a key partner of Thai private sector to achieve net zero carbon emission

with private and public sector to combat climate change issue that comes across export sector

of carbon credit market to be a key infrastructure to overcome new export barrier e.g. **CBAM**

"EXIM as Development Bank will play an important role to support green investments over the next decades"

COLLABORATION

DEVELOPMENT

Paris Agreement

Number of Projects  
**321**

Installed Capacity  
**6,620**  
MW

Total EXIM Financing  
**62,183**  
Million THB  
(1.9 Billion USD)

Total Green Investment  
**379,218**  
Million THB  
(12 Billion USD)

Emission Reduction  
**> 100**  
Million Tons

## EXIM Bank moves toward Green & Blue Economy



Moving Towards...

50%

Example project that links to BMA : EV Ferry in Chao Phraya river and EV Bus



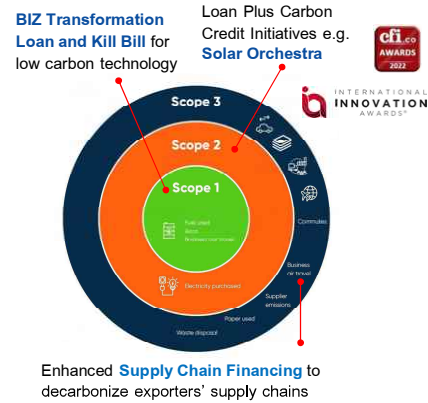
## EXIM Bank's way to help Thai economy tackle climate change

Net Zero GHG or Carbon Neutrality = (Scope 1 + Scope 2 + Scope 3) - Carbon Offset

Climate Finance      Carbon Market



### Internal Blueprint of EXIM's Climate Finance



## EXIM Bank's Role in Carbon Market

RE 100

FTI CCI

carbon neutral network

คณะกรรมการด้านพลังงาน สหกรณ์การเกษตร

ธนาคารแห่งประเทศไทย BANK OF THAILAND Thailand Taxonomy

- **Purpose:** To promote use of renewable energy of the nation
- **Role of EXIM:** founder member & committee

The owner of digital trading platform for carbon credit of Thailand  
EXIM is the founder member and committee

- **Purpose:** To help support Carbon Neutrality Policy of the government
- **Role of EXIM:** Committee & Head of Climate Finance Group

- **Purpose:** To promote use of renewable energy focusing on demand side for nation security
- **Role of EXIM:** Advisor

- **Purpose:** To define and label business activities based on CO<sub>2</sub> emission
- **Role of EXIM:** Working Group

Decarbonization = Collaboration



# JGC's Capabilities & Solutions on Hydrogen & Ammonia

Enhancing planetary health



# JGC Overview Update

Enhancing planetary health



## JGC Group Profile

<p><b>Established</b> <b>1928</b></p>	<p><b>Total Group Manpower</b> <b>Approx. 8,100</b> <small>*EPC Business only</small></p>
<p><b>Project Record</b> <b>20,000 projects</b> <b>In over 80 countries</b></p>	<p><b>Zero Accidents Record</b> <b>130 million hours</b> <small>*For the total duration of the Qatar gas processing project from July 12, 2012 to March 25, 2014</small></p>
<p><b>Net Sales</b> <b>US\$ 3.50 billion</b> <small>FY 2021 (April 1, 2021 – March 31, 2022)</small></p>	<p><b>Overseas Sales Ratio</b> <b>Approx. 68 %</b> <small>FY 2021 (April 1, 2021 – March 31, 2022)</small></p>

## JGC Group – Overseas experience

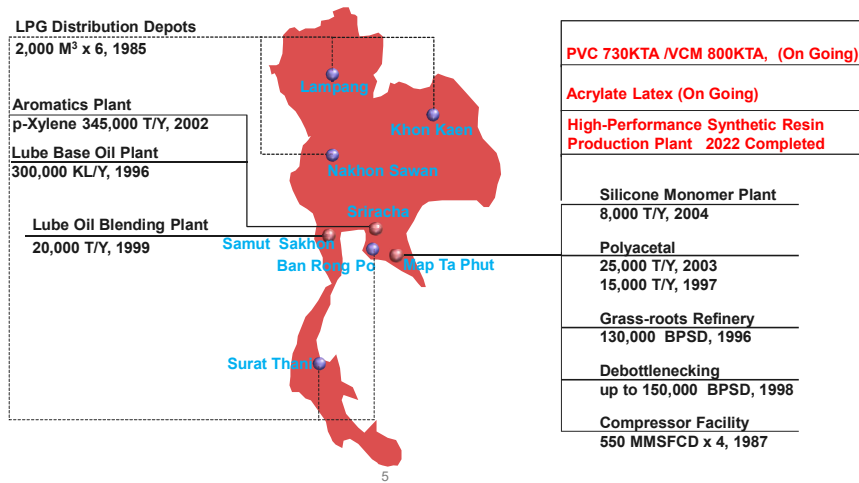


## Business Area



\*FPSO: Floating Production Storage and Offloading

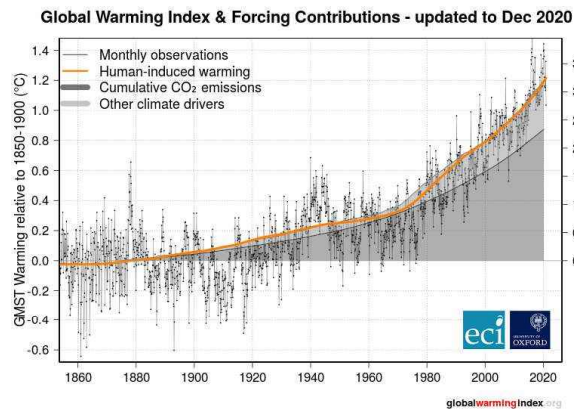
## Major Experience in Thailand



## Hydrogen and Ammonia



## Global Warming & CO2 emissions



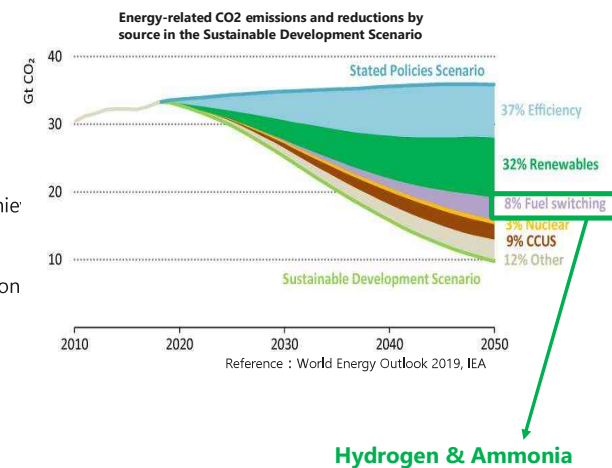
Human-induced warming contributes approx. **1.2 degC** to earth's temperature after the Industrial Revolution.

CO<sub>2</sub> emissions are the biggest contributor to human-induced climate change

© Richard Barfield / WWF-UK

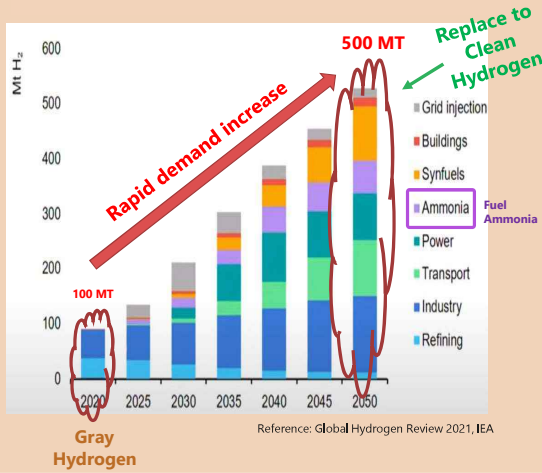
## World Decarbonization Trend

- ✓ As the world's population is growing rapidly, continuous energy supply is an essential issue.
- ✓ However, the trend of energy decarbonization cannot be stopped.
- ✓ Main countries and companies declared to achieve Net Zero Emission by 2050 or 2060.
- ✓ Therefore, it is necessary to replace hydrocarbon fuel by **zero emission fuel**.



# Hydrogen as Switching Fuel

## Worldwide Clean Hydrogen Demand



## Why Hydrogen ?



# Clean Hydrogen as Switching Fuel

## < Hydrogen as Fuel >



## < How to produce Clean Hydrogen >

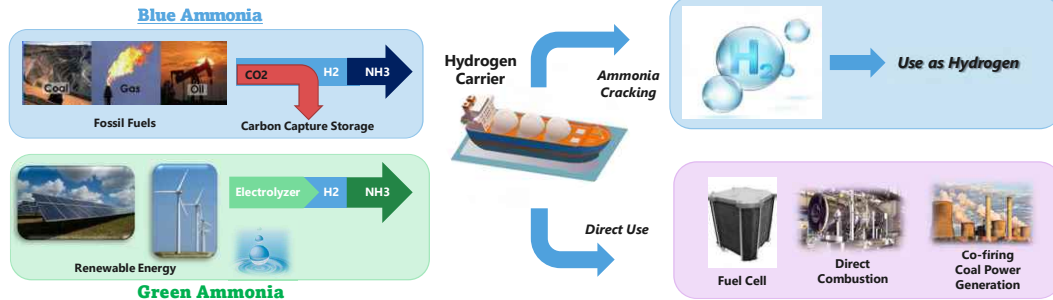


# Ammonia as Hydrogen Carrier

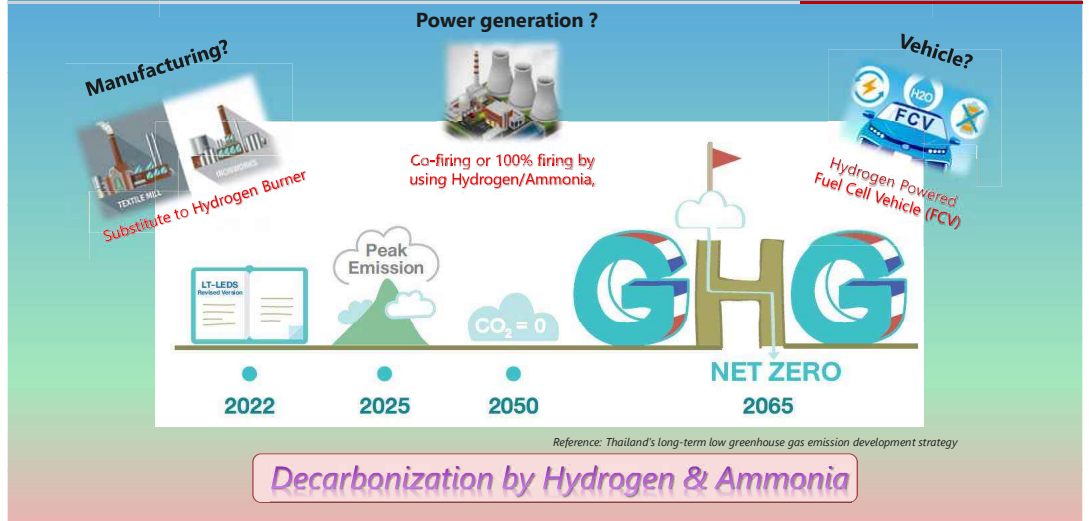
## < Conventional Ammonia Use >



## < Use as Hydrogen Carrier >



# Achieving Carbon Neutrality & Net Zero Emission



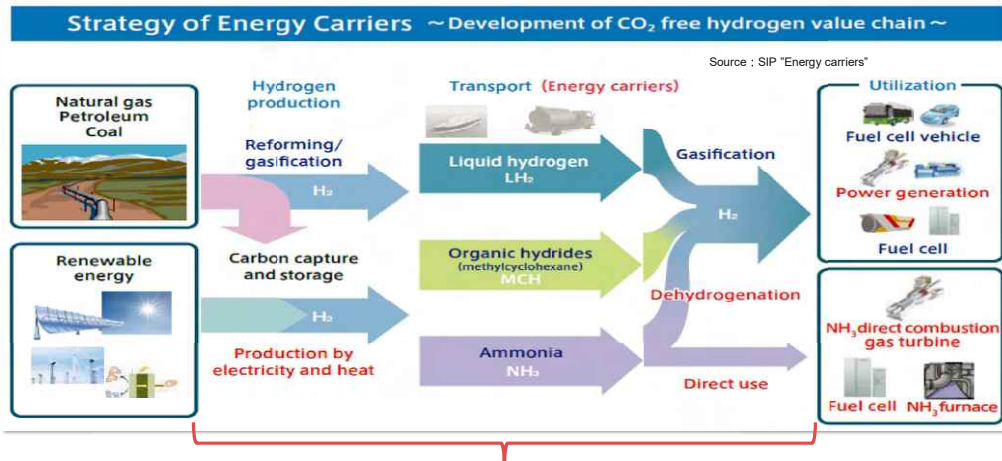
# How to manage Hydrogen ?

## Produce? Import?

### JGC's Solutions for Hydrogen & Ammonia

Enhancing planetary health

### JGC's Solutions in Hydrogen Value Chain



JGC can provide "Solutions" from Feasibility Study to EPC

### JGC's Green Hydrogen Project Experience

Location	RE Source	Electrolyzer	Product	Scope	Year
Japan	PV	Alkaline	Ammonia	Owner / FEED / EPC	On going
South-East Asia	Not Disclosed	Alkaline/PEM	MCH	FS	On going
South-East Asia	Not Disclosed	Alkaline/PEM	MCH	Pre-FS, FS	On going
South-East Asia	PV, Wind	Alkaline/PEM	Ammonia	Pre-FS	2022
Azerbaijan	PV, Wind	Alkaline/PEM	Ammonia	Pre-FS	2022
Australia	PV	PEM	Hydrogen	FS, FEED	2020-2021
Middle East	PV	Alkaline	Ammonia	Pre-FS	2021
South-East Asia	Not Disclosed	Alkaline/PEM	Hydrogen	Pre-FS	2020-2021
Australia	PV	PEM	Hydrogen	FS, FEED	2020-2021
FREA, Japan	(PV)	(PEM)	Ammonia	EP & Operation	2018*1 - 2020
Japan	Bioresource	-	H2/ Ammonia	Pre-FS	2019
Japan	Wind	PEM	Hydrogen	Pre-FS	2019
Middle East	PV	Alkaline/PEM	Ammonia	Pre-FS	2019
Japan	PV	Alkaline	Ammonia	FS	2018
Australia	PV	Alkaline	Hydrogen	Pre-FS	2017
Japan	Wind	PEM	Hydrogen	Pre-FS	2016

\*1: Demonstration Project under SIP Energy Carrier

## JGC's Blue Hydrogen Project Experience

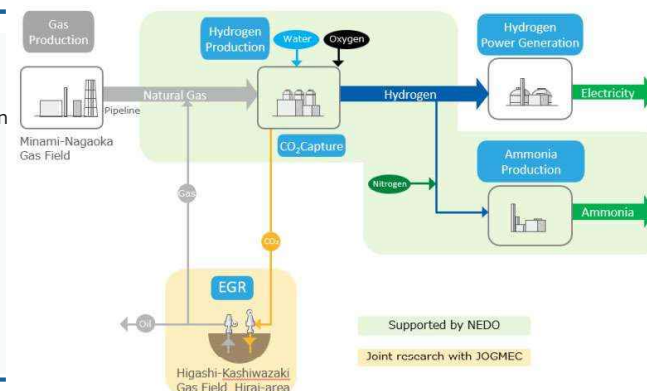
Client	Location	Process	Product	Capacity	Scope of Work	Completion
INPEX	Japan	ATR	H2 / Ammonia	700 tpa	EPC	On-going
Not disclosed	USA	SMR	Ammonia	Not disclosed	FS	On-going
Not disclosed	Middle East	-	MCH	Not disclosed	FS	On-going
Not disclosed	South East Asia	-	MCH	Not disclosed	FS	On-going
Not disclosed	Russia	ATR	Ammonia	Not disclosed	FS	2021
Not disclosed	Middle East	Gasification	Ammonia	Not disclosed	Pre-FS	2020
METI/ IEEJ	Middle East	Gasification	Ammonia	Not disclosed	Pre-FS	2019
SIP/ JST	Middle East	SMR	Ammonia	3,300 tpd	FS	2018
SIP/ JST	USA	ATR	Ammonia	7,000 tpd	FS	2018
SIP/ JST	USA	SMR	Ammonia	3,300 tpd	FS	2018
Not disclosed	USA	Gasification	Ammonia, CO2 as By-Product	Not disclosed	FS	2006

\*1: Demonstration Project under SIP Energy Carrier

## Project Reference : Blue Hydrogen/Ammonia Demonstration Project in Japan

### Outline

- JGC has been awarded EPC of **Blue Hydrogen/Ammonia Demonstration project in Japan** by INPEX. Completion scheduled in 2025.
- Hydrogen Capacity 700t/year, Ammonia Capacity 500t/year
- Carbon capture facility** will apply high-pressure regenerative CO<sub>2</sub> capture technology (**HiPACT**) developed by JGC and BASF.



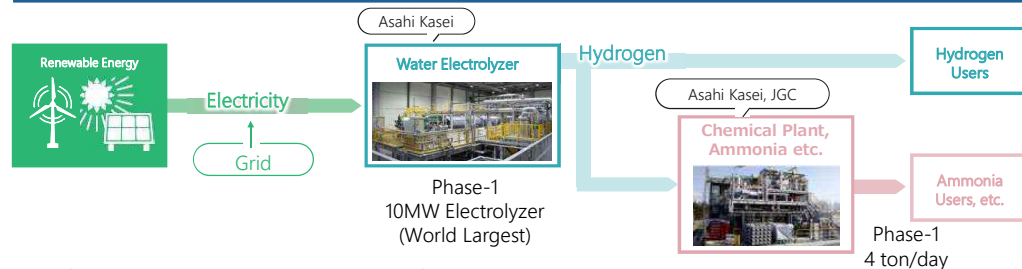
Reference: <https://www.inpex.co.jp/english/news/assets/pdf/20221115.pdf>

## JGC's Activities for Green Ammonia <Power to Chemical Demonstration>

### Outline

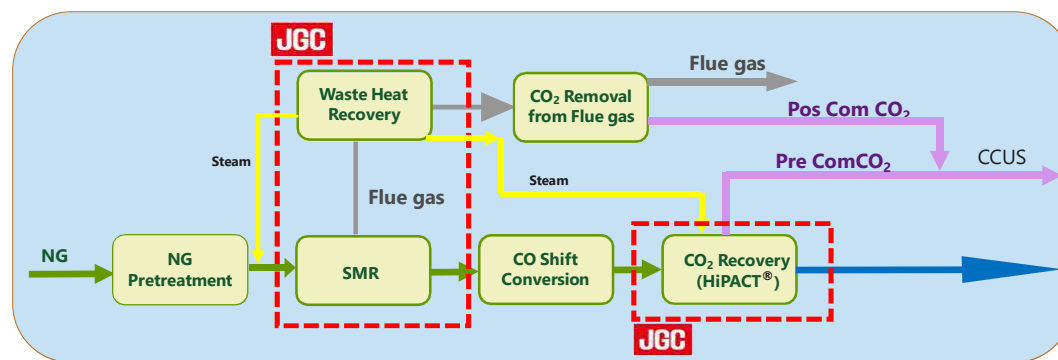


- JGC and Asahi Kasei have been selected and started "Large-scale Alkaline Water Electrolysis System Development and Green Chemical Plant Demonstration" under "Green Innovation Fund" by NEDO \*
- Semi-commercial scale (Phase 1) and Commercial scale (Phase 2) for 10 years till FY 2030
- Phase-1 (10MW Electrolyzer, 4 ton/day NH<sub>3</sub>) operation will be started in Fiscal Year 2026.
- Phase-2 Electrolyzer will be 40MW scale.



\* NEDO (New Energy and Industrial Technology Development Organization) , <https://www.jgc.com/jp/news/assets/pdf/20210826j.pdf>

## JGC's Own Technology for Blue H2 Production



JGC has own process technology to produce **Blue Hydrogen**

# Fuel Ammonia Approach

JGC and TOYO entered Business Alliance for Fuel Ammonia Project

**JGC**

**TOYO ENGINEERING**

**Strengths**

**Strengths**

- Extensive experience in the countries where the ammonia plants are being planned
- More than 20,000 projects in over 80 countries
- Extensive experience with KBR licensed ammonia plant
- 86 conventional Ammonia projects

**Ammonia Alliance Japan**

Strongest KBR licensee contractor **KBR**

## Reliability of KBR Technology Ammonia Plant



**KBR** is The World Leader in Ammonia Technology, **252** ammonia plants awarded since 1944

World's **largest** ammonia plant with single converter

+3,000 MTPD

World's most **energy-efficient** ammonia plant

6.27 Gcal/MT

World's most **reliable** ammonia plant

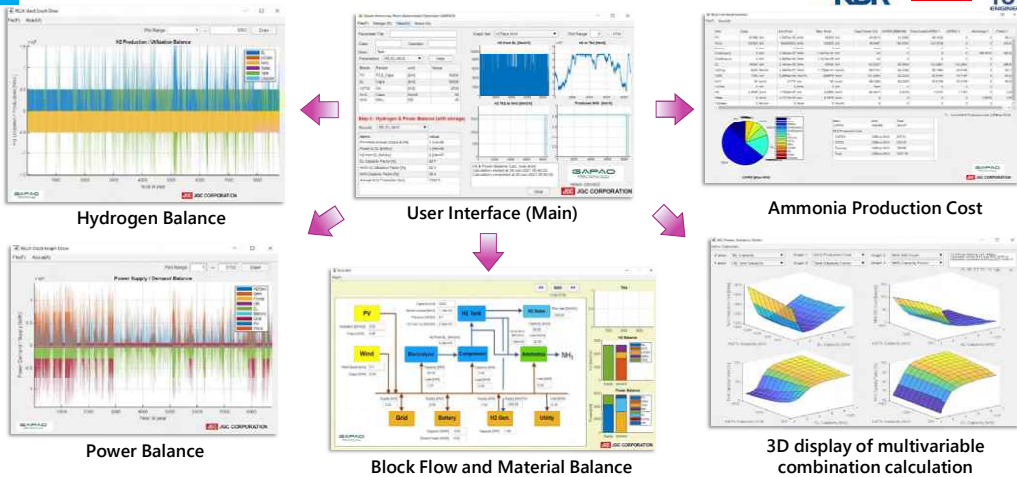
2,162 consecutive days in operation

AMMONIA CAPACITY MARKET SHARE (SINCE 2010)

**+50%** Market share

All based on SMR + Air-ATR

## Green Ammonia design optimization approach by GAPAO™



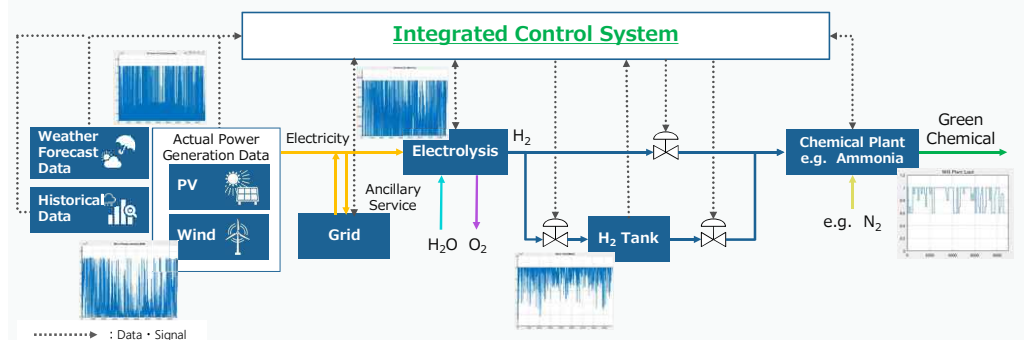
Suggest most optimum design by GAPAO™

## JGC's Activities for Green Ammonia <Integrated Control System>



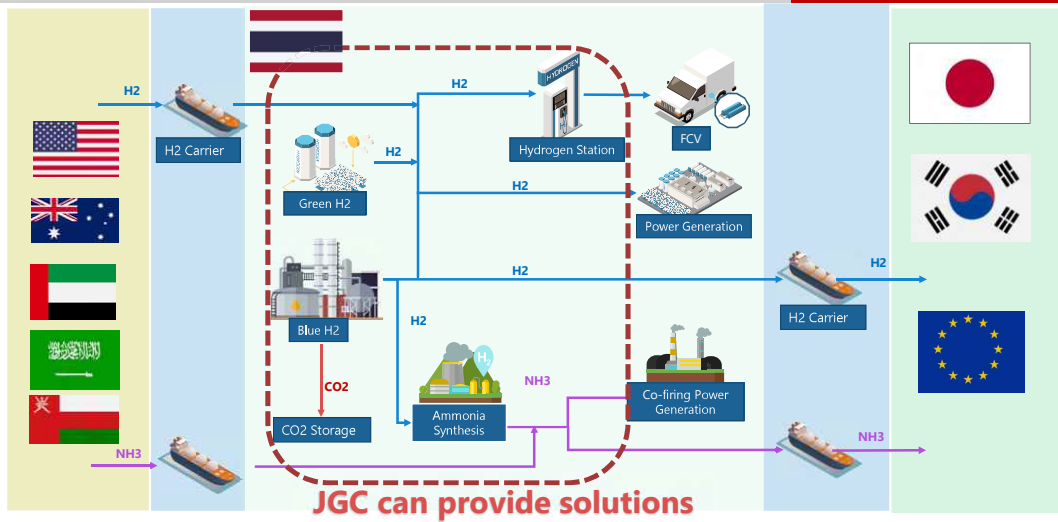
**Outline**

In Green Chemical Process, such as Ammonia, fed with Hydrogen derived from **Fluctuating Renewable Energy**, "**Integrated Control System**" which manages hydrogen supply and realize plant's optimum operation with **minimum downtime** will be developed and demonstrated.





## Hydrogen & Ammonia Supply Chain in Thailand



## Realizing Sustainable Society

Low Carbon Solution		Decarbonization		Carbon-Free Energy	
LNG	Bio	Recycling	CCS/CCUS	Renewable Energy	Hydrogen & Ammonia
<b>Technology/Concept</b>					
<ul style="list-style-type: none"> <li>◆ AIRLIZE LNG®</li> <li>◆ LNG Digital</li> <li>◆ MixGen®</li> <li>◆ LNG Fit</li> <li>◆ Decarbonized LNG</li> </ul>	<ul style="list-style-type: none"> <li>◆ Bio LNG</li> <li>◆ Bio Chemical</li> <li>◆ Green Refinery (Pyrolysis oil from biomass)</li> </ul>	<ul style="list-style-type: none"> <li>◆ SAF (Sustainable Aviation Fuel)</li> <li>◆ Gasification of Plastic Waste</li> <li>◆ Pyrolysis of Plastic Waste</li> <li>◆ Polyester Chemical Recycling</li> </ul>	<ul style="list-style-type: none"> <li>◆ DDR Membrane</li> <li>◆ HIPACT®</li> <li>◆ Mineral Carbonation</li> <li>◆ Carbon Credit</li> </ul>	<ul style="list-style-type: none"> <li>◆ PV SMOOTHER™</li> <li>◆ Solar Power Generation</li> <li>◆ Biomass Power Generation</li> </ul>	<ul style="list-style-type: none"> <li>◆ CO2 free ammonia</li> <li>◆ CO2 free hydrogen</li> <li>◆ Fuel Ammonia Alliance</li> </ul>
<b>Experience</b>					
<b>48 Trains</b> Over 30% of world's total LNG production	<b>Demonstration in Japan, Feasibility Studies</b>	<b>Feasibility Studies, Pre-FEED, FEED, Commercialization in Japan</b>	<b>4 EPC projects</b> (Algeria, Australia, Japan) <b>Feasibility Studies</b>	<b>Solar Power Generation: 27 EPC Projects</b> <b>Biomass Power Generation: 4 EPC Projects</b>	<b>Demonstration in Japan, Feasibility Studies, FEED</b>

# Contact to us

## JGC Corporation

**Head Office**  
Business Development & Marketing Division  
Sustainable Solution Sales

[sun.chen@jgc.com](mailto:sun.chen@jgc.com) / [gulati.ishan@jgc.com](mailto:gulati.ishan@jgc.com)

**Bangkok Office**

[anno.tsuyoshi@jgc.com](mailto:anno.tsuyoshi@jgc.com) / [patchaiwong.pakkinee@jgc.com](mailto:patchaiwong.pakkinee@jgc.com)

**JGC**

Enhancing planetary health

<https://www.jgc.com/en/>



## FOMM Corporation - Smart Society Created by FOMM-

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## -About Us-



We develop the best mobility for short distance travel, which is the "first step" for our customers. We aim to be a mobility company that provides the world with the technologies we have created.



### FOMM Corporation CEO Hideo Tsurumaki

Born in 1962 in Fukushima Prefecture. Graduated from Tokyo Metropolitan College of Aviation Technology (now Tokyo Metropolitan College of Industrial Technology). In 1982, joined Suzuki Motor Corporation (now Suzuki Motor Co., Ltd.), where in charge of a wide range of design work, from motorcycle engines to vehicle bodies. In 1997, moved to Araco Corporation, where involved in the development of the Coms, a single-seater electric vehicle. Ltd., the successor to Araco, where involved in the planning and development of the new COMS model. Ltd. in 2012, where involved in the planning and development of the new COMS model. In 2013, founded FOMM Corporation.

### < Background to the Establishment of the Company >

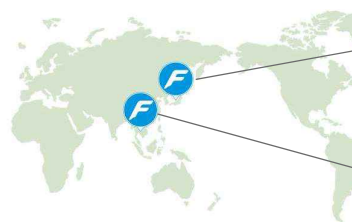
Damage caused by the tsunami that followed the Great East Japan Earthquake on March 11, 2011.

- Number of vehicles damaged by the flood: 236,000
  - Number of people who died in their cars while evacuating from the flood: 700
- These factors have led people to advocate the dangers of evacuating by car in the event of flooding.  
**Families with elderly people and small children need a means of escape from flooding.**

Hideo Tsurumaki decided to develop a "small electric vehicle that can float and move on water",  
And on February 4, 2013, established FOMM Corporation.

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## -About Us-



	Company name	FOMM Corporation
	Location	Kanagawa, Japan
	Founded	February 2013
	Business	Planning and development of compact EV
	Company name	FOMM (ASIA) CO.,LTD.
	Location	Bangkok, Thailand
	Founded	February 2016
	Business	Manufacture and sales of compact EV

### < Three business keywords >

#### Mobility Technology

Planning and development of mobility suitable for the area where it will be used and for the intended use.



#### Mobility Service

Plan and develop original services by utilizing the company's own mobility and related technologies.



#### Micro-Fab

Provide the best production systems for mobility manufacturing and their licenses worldwide.



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## - Product and Technology Overview -



General Specification of Vehicle		Performance	
Dimensions	Type	Minimum Turning Radius	
	Steering Wheel Position	3.8m	
	Overall Length	Maximum Speed	
	Overall Width	80km/h	
	Overall Height	Full Charge Mileage	
	Wheel Base	166km	
Weight / Seating Capacity	Front Tread/Rear Tread	Maximum angle of which you can start on a slope *1	
	Ground Clearance	*1 Gross Vehicle Weight	
	Maximum Vehicle Weight	10 Minutes Maximum Power (Motor/level)	
	Gross Vehicle Weight	Maximum Torque (N.m/kg.m/rev)	
	Maximum Loading Capacity	Driving Type	
	Seating Capacity	Steering Type	
Battery for Driving	Type	Rear Wheel	
	Capacity	Front Wheel	
	Total Power	Rear Wheel	
	Standard Charge (TYPE/MODEL)	Service Brake Type	
Charging Time	Standard Charge (TYPE/MODEL)	Drum Type (4 Front/2 Rear)	

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## - Product and Technology Overview -



In January 2021, it was certified as a "Kei car" and began taking orders in March of the same year. More than 35 units were sold.

- ENEOS Holdings Inc introduced the vehicle as a car sharing vehicle.
- Sales to the general public, etc.



Mass production began in March 2019 and delivery to customers began in April of the same year. More than 432 units were sold.

- Banpu NEXT Co., Ltd. introduced the vehicle as a car sharing vehicle.
- Sales to the general public, etc.



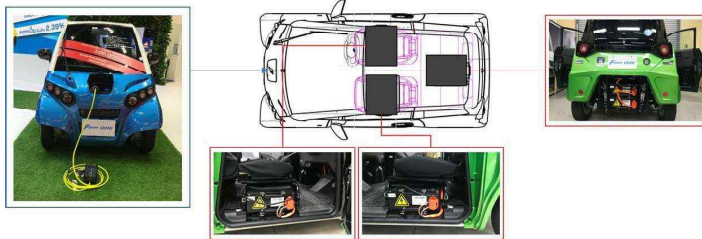
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## - Product and Technology Overview -



### Swapping Battery System

Equipped with a Swappable cassette-type battery. \*2.96kWh × 4Pac = 11.84kWh/Set  
In addition to recharging at home, Battery Swap Service is available at "Battery Swap Station" around town. \*Battery Swap Service is in preparation.



### < Battery Swapping procedure >



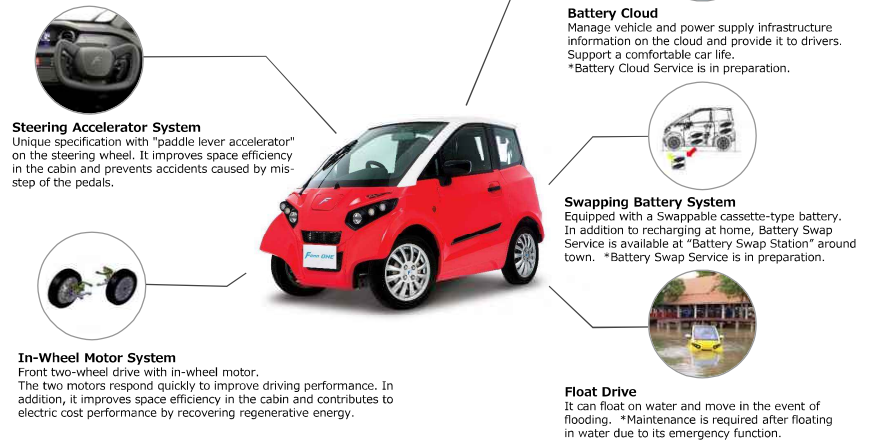
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## - Product and Technology Overview -



## FOMM ONE

### - Five Distinctive Technologies -

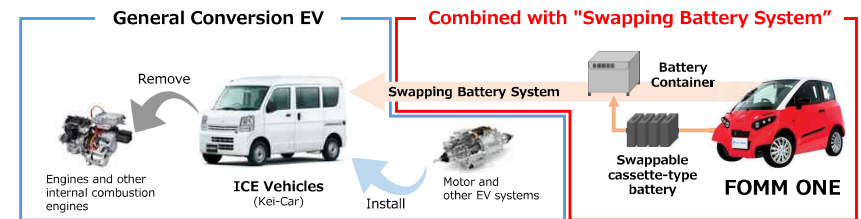


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## - Overview of New Technology Development -



### Development of "Battery-swappable Conversion EV"



### Background to Development

#### Concerns of Logistics Companies in Japan

- The government is urging the introduction of EVs, but there are no EVs with applications and price ranges that match the logistics business, so the introduction of EVs is not proceeding.
- The price of EVs is too high for individual logistics operators to purchase.
- When replacing vehicles with EVs, the current fleet of internal combustion engine vehicles will be disposed of, which raises doubts from the perspective of environmental preservation.
- Preparing EVs, equipment for charging, and a system to manage them will result in high operating costs.

#### Advantages of "Battery-swappable Conversion EV"

- (1) **Low-cost introduction**: If already own internal combustion engine vehicles, do not need to pay for a new vehicle body and can obtain an EV with only the cost of conversion
- (2) **Contribution to environmental preservation**: By converting used internal combustion engine vehicles to EVs, used vehicles can be "upcycled" into new products and revived, reducing the number of discarded vehicles.
- (3) **Reduced cost of installing charging facilities**: By introducing battery-swappable EVs, the cost of installing EV-specific charging facilities can be saved.
- (4) **Reduce the time it takes to charge EVs**: By introducing battery-replaceable EVs, the replacement process can be completed in 3~10 minutes.

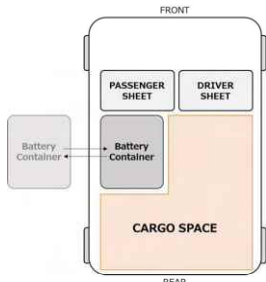
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- Overview of New Technology Development -

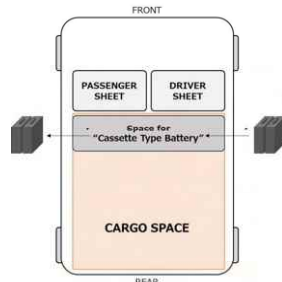


Two types of "Battery-swappable conversion EV" were developed.

< "Battery Container" equipped type >  
Battery swap time: 3~5 minutes



<Battery flat equipped type>  
Battery swap time: 10 minutes



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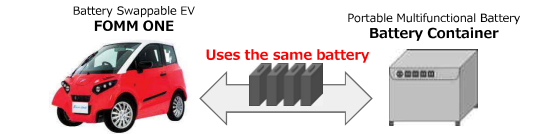
- Overview of New Technology Development -



"Battery Container" specification

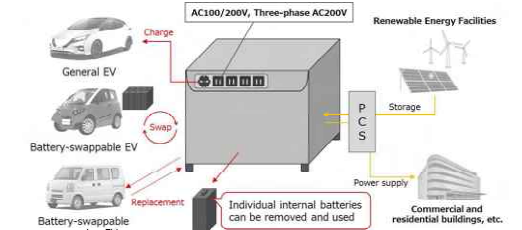


Dimensions (mm)	Overall length	475
	Overall width	680
	Overall height	650
Weight (kg)	With battery installed	180 - 200
Battery capacity (kWh)		11.84
Built-in battery	Name	FOMM MAIN BATTERY
	Type	Li-Ion
	Capacity (kWh)	2.96
	Number of Built-in batteries (pcs)	4
Output capacity (W)		3,000
Rated voltage (V)		118.40
Output function	Single phase AC100V (ports)	4
	Single phase AC200V (ports)	1
	Three-phase AC200V (ports)	1
	USB-A 5V	2
Output waveform		Sinusoidal wave
Input function	Single phase AC100V	15 hours (0 - 100%)
	Single phase AC200V	7.5 hours (0 - 100%)
	Three-phase AC200V	2.5 hours (0 - 100%)
Dustproof performance		Complies with IP65 (JIS-2137) standard class 6
Waterproof performance		Complies with IP65 (JIS-2137) standard class 5



■ Benefits for users of each product  
**FOMM ONE users** : Increased number of battery exchange stations due to the widespread use of Battery Container.  
**Battery Container User** : Can be used as an inexpensive, portable, high-capacity storage battery.

A "portable multifunctional battery" that can be used for a variety of applications.



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- Overview of New Technology Development -



< Battery-swappable Conversion EV >



Items based on original vehicle specifications	Brand / Model	Suzuki / EVERY
	Type	XBD-DA64V
	Seating capacity	4
	Overall length	3,395
	Overall width	1,475
	Overall height	1,790 (mm)
	Wheelbase	2,400 (mm)
	Tread Front/Rear	1,300/1,290 (mm)
Items that change after conversion	Maximum loading capacity	350kg
	Battery	Battery Container
	Battery capacity	2.96kWh x 4 pacs (11.84kWh)
	Cruising range	100km
	Maximum speed	80km/h
	Charging method	• Normal charging (Type1/Mode2) • Battery Swapping system
	Charging power	• AC200V (50/60Hz)
	Charging time	7.5h (SoC:0~100%)

< Battery Container >



Dimensions (mm)	Overall length	475	
	Overall width	680	
	Overall height	650	
	Weight (kg)	With battery installed	180 - 200
		Battery capacity (kWh)	11.84
	Built-in battery	Name	FOMM MAIN BATTERY
		Type	Li-Ion
		Capacity (kWh)	2.96
Number of Built-in batteries (pcs)		4	
Output capacity (W)		3,000	
	Rated voltage (V)	118.40	
Output function	Single phase AC100V (ports)	4	
	Single phase AC200V (ports)	1	
	Three-phase AC200V (ports)	1	
	USB-A 5V	2	
	Output waveform		Sinusoidal wave
Input function	Single phase AC100V	15 hours (0 - 100%)	
	Single phase AC200V	7.5 hours (0 - 100%)	
	Three-phase AC200V	2.5 hours (0 - 100%)	
Dustproof performance		Complies with IP65 (JIS-2137) standard class 6	
Waterproof performance		Complies with IP65 (JIS-2137) standard class 5	

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- Overview of New Technology Development -



Status of this year's initiatives related to conversion EV projects.

6 June 2022: Obtain a 'Private freight vehicle' number for battery box-mounted systems.



22 September 2022: Change to 'business usage' number.



3 October 2022: the Ministry of the Environment's demonstration project started introducing demonstrations in logistics projects.

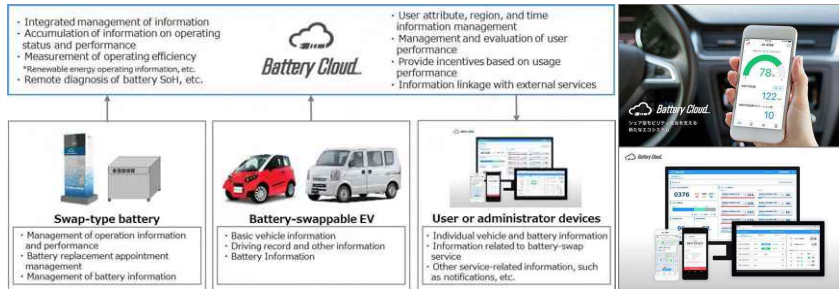


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30 September 2022. Press release on the start of the demonstration with Marubeni Corporation.

## Battery Cloud

- Cloud system for more comfortable use of "Battery-Swappable EV".
- Integrated management of vehicle and Battery Container information on the cloud.
- The system supports users with a variety of functions, such as driving route guidance following the "Battery Swap Station" and battery degradation diagnosis.

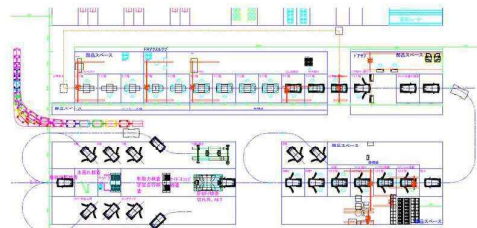


\*Images are current as of the time of development.

## Micro-Fab

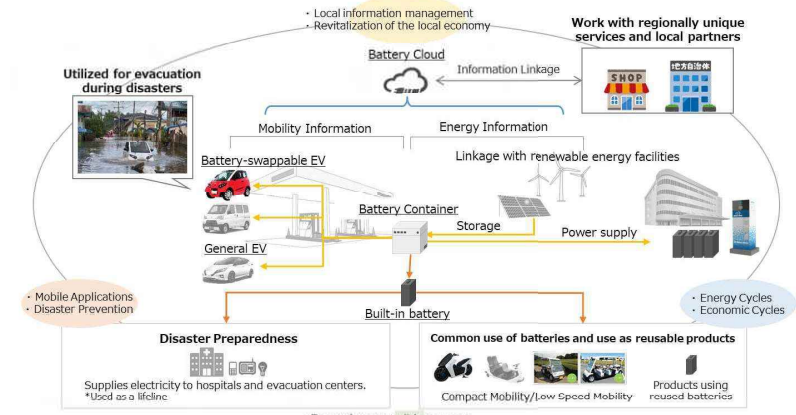
### What is Micro-Fab?

- Small-scale plant with small investment and small production volume
- Minimum production unit : Small plant with annual production of 10,000 units
- Reduction of press, painting, and welding processes, and cost reduction in equipment and labor
- Local procurement of non-core parts to reduce parts procurement costs



### Smart Area : Regional Smart Concept by Combining Technology and Service

Linking specific regions with products and services and integrating and managing their respective information to create the smallest possible region with excellent economic and energy circulation and disaster preparedness.



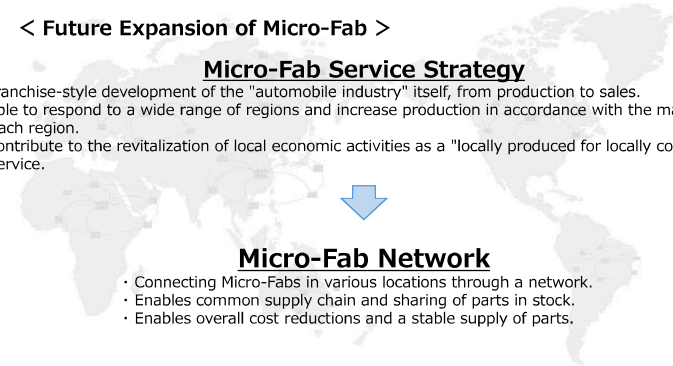
Promote "Smart-ization" while preserving local lifestyles.

## Micro-Fab

### < Future Expansion of Micro-Fab >

#### Micro-Fab Service Strategy

- Franchise-style development of the "automobile industry" itself, from production to sales.
- Able to respond to a wide range of regions and increase production in accordance with the market in each region.
- Contribute to the revitalization of local economic activities as a "locally produced for locally consumed" service.



#### Micro-Fab Network

- Connecting Micro-Fabs in various locations through a network.
- Enables common supply chain and sharing of parts in stock.
- Enables overall cost reductions and a stable supply of parts.



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Creating new values from  
Finance × Services × Business Expertise  
**Tokyo Century Corporation**

# Energy Saving Service in Thailand



## Business Summary by Operating Segment

Equipment Leasing	Mobility & Fleet Management	Specialty Financing	International Business
Offering financial services linked to all types of assets, including information and communications equipment, office equipment, factory equipment, construction machinery, and commercial equipment.	Delivering quality services for each use case from a broad lineup, from auto leasing for both corporate customers and individuals to car rental services.	Providing financial services that draw on our highly specialized expertise in areas such as shipping, aviation, environment and energy, real estate, structured finance, and principal investment.	Delivering specialized services on a global scale to address local needs by partnering with leading local companies and financial institutions to promote our alliance strategy.

Boosting the value of the leasing business while accelerating the pursuit of co-creative business with prime partners, including the NTT Group and NX Group, in the environment and energy, and the digital transformation fields. Promoting the creation of new services and businesses that integrate digital technology with the leasing and finance businesses.

Meeting customer needs, through Nippon Car Solutions, Nippon Rent-A-Car Service, and Orico Auto Leasing while also promoting collaborative ventures with diverse business partners for creating new businesses and next-generation mobility services that include the use of EVs.

Operating an aviation business based on our value chain centered on the Aviation Capital Group. Expanding business opportunities using TC Kobelco Real Estate's platform and generating synergies in the environment and energy field to develop viable businesses that harness our expertise in each product area.

Leveraging our network to provide services in more than 30 countries and regions. The major U.S. IT equipment leasing company CSI Leasing has expanded its business base in Asia and Northern Europe. In the U.S., a dealer business is operated for small- and medium-sized trucks, arbor equipment, and small construction machinery, and customers are provided with a one-stop service, covering everything from sales to financing.



## Company Outline

**Company Name**

Tokyo Century Corporation

**Founded**

July 1, 1969

**Paid-in Capital**

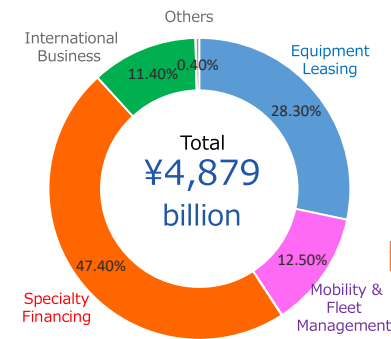
¥81.1 Billion

**Stock Listing**

Tokyo Stock Exchange,  
Prime Market

**Segment Assets** (Unit: JPY)

(As of March 31, 2022)



**Employees(As of March 31, 2022)**

**7,634**  
(Consolidated)

**919**  
(Non-Consolidated)

**Revenues**

¥1,278 billion

**Operating Income**

¥82.7 billion



**Tokyo Century Corporation**

Tokyo Century



## Global Network

**Overseas Network**

Tokyo Century has 37 subsidiaries and affiliates overseas. In South East Asia countries, Tokyo Century has 7 subsidiaries and affiliates. Tokyo Century provide various finance service depends on clients demand.



**Consolidated Subsidiaries**

- Tokyo Century Leasing China Corporation
- Tokyo Century Factoring China Corporation
- Tokyo Century Leasing (Singapore) Pte. Ltd.
- Tokyo Century Capital (Malaysia) Sdn. Bhd.
- PT. Century Tokyo Leasing Indonesia
- PT. CT Indonesia
- TISCO Tokyo Leasing Co., Ltd.
- TC Advanced Solutions Co., Ltd.
- TC Car Solutions (Thailand) Co., Ltd.
- HTC Leasing Co., Ltd.
- Tokyo Leasing (Hong Kong) Ltd.
- CSI Leasing, Inc.
- Tokyo Century (USA) Inc.
- TC Aviation Capital Ireland Ltd.
- TC Skyward Aviation U.S., Inc.
- TC Skyward Aviation Ireland Ltd. Tokyo Leasing (UK) Plc

**Equity-Method Affiliates**

- President Tokyo Corporation
- Tong-Sheng Finance Leasing Co., Ltd.
- Dalian Bingshan Group
- Hua Hui Da Financial Leasing Co., Ltd.
- Suzhou New District Furui Leasing Co., Ltd.
- BPI Century Tokyo Lease & Finance Corporation
- PT. Hexa Finance Indonesia
- GA Telesis, LLC

(NOTE: FINANCING PARTNER IS INCLUDED IN LISTING. PARTNER IS OMISSIONED AS IS ORGANIZATION CATEGORY.)

- Suzhou New District Furui Leasing Co., Ltd.
- BPI Century Tokyo Lease & Finance Corporation
- PT. Hexa Finance Indonesia
- GA Telesis, LLC

**Other**

- TATA Capital Financial Services Limited

※ We acquired the shares of Yoma Fleet Ltd. on April 2019



## What is ESCO/BEMS?

### ESCO Service: Comprehensive energy saving solution

1. Design & install energy efficient equipment to reduce utility cost
2. Maintain & manages the operation of energy saving equipment
3. Guarantee Energy saving effects



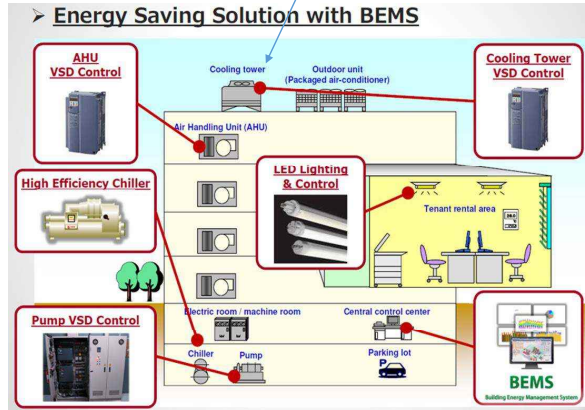
BEMS, "Building Energy Management System" is a system that controls and manages the building facilities and energy to improve energy efficiency and reduce operation cost.



Air Conditioner



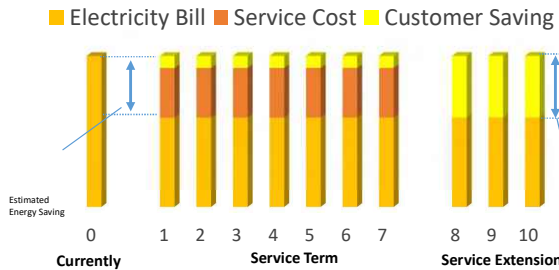
Lighting



## Cashflow Illustration

Below is an illustration of Energy saving service' concept.

As shown in the illustration, after 7 years where customer complete the installment payment for the equipment, electricity bill that are reduced will be entirely profit of the customer.



Cash Flow Simulation

(Mill IDR)

	Estimated Energy Saving	Service Cost	Customer Saving
Year 1	4,080	3,735	345
Year 2	4,080	3,735	345
Year 3	4,080	3,735	345
Year 4	4,080	3,735	345
Year 5	4,080	3,735	345
Year 6	4,080	3,735	345
Year 7	4,080	3,735	345
<b>Cumulative Saving at end of Year 7</b>			<b>2,415</b>
Year 8	4,080	0	4,080
Year 9	4,080	0	4,080
Year 10	4,080	0	4,080

After the installments are completed, entire Estimated Energy Saving will be customer's profit.

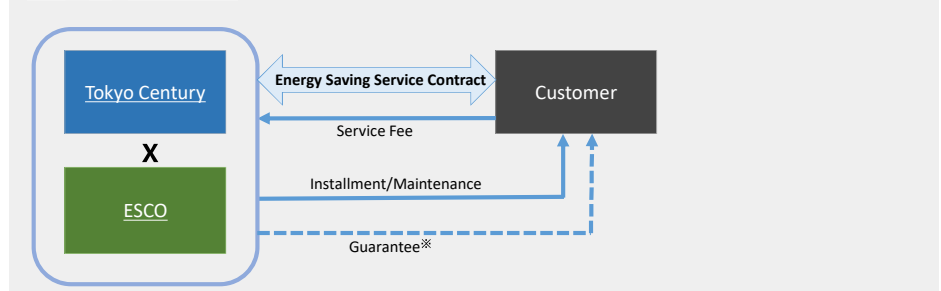
※Service Cost = Installment + Maintenance + Guarantee fee

※Guarantee  
If the Service Fee is higher than Cost Saving, the difference will be compensated.



## Energy Saving Service: Scheme

### Contract Relation



- Appropriate equipment procured, installed, and maintenance provided by ESCO
- Energy Savings guaranteed for customer.
- After 7 years Energy Saving = Customer Saving.



## Joint Crediting Mechanism : JCM

The JCM is a system to cooperate with partner countries for reducing GHG emissions, in which the result of reduction is assessed as contribution by both partner countries and Japan.

Under the JCM, Japan will evaluate its contributions to GHG emission reductions in quantitative manner and use them to achieve Japan's emission reduction target.

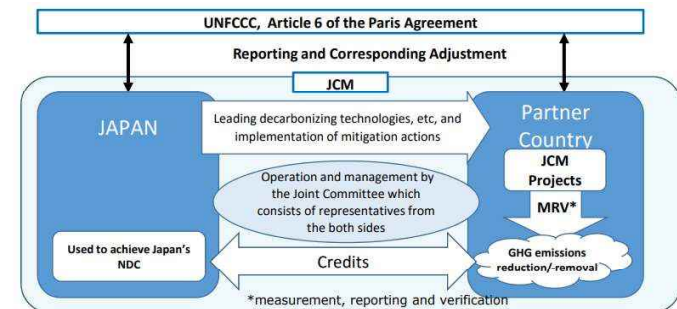
### JCM Model Projects :

Japanese Government offers subsidy for part of initial Capex of installing low carbon technologies.

**NEW**

### JCM Eco-lease Scheme:

Japanese Government offers subsidy for part of lease fee on low carbon equipment.





Tokyo Century's JCM Projects



Potential Equipment applicable for JCM Subsidy (examples)

Energy Efficiency	Air Conditioning Unit
	Refrigeration/Cooling Machine
	Boiler
Energy Utilization	Waste heat recovery power generation
	Cogeneration
Renewable Energy	Solar
	Hydropower (micro)
	Windpower



Contact

Tokyo Century Corporation (TC)



Takashi AOKI

Tel : +81-90-1044-7503



Kenji KAKUMOTO

Tel : +81-70-3049-1057

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