27th CTCN Advisory Board Meeting

Overview and Progress of the Cambodia TA Project

Development of National Green Hydrogen Roadmap for Accelerating Carbon Neutrality (2024000042)

Apr. 17th -22nd , 2026

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National Institute of Green Technology (NIGT)

27th CTCN Advisory Board Meeting

CONTENTS

국가녹색기술연구소
NATIONAL INSTITUTE OF GREEN TECHNOLOGY

Ⅰ. Summary

Ⅰ. Summary

Title of TA: Development of National Green Hydrogen Roadmap for Accelerating Carbon Neutrality

Requesting Country & NDE

- **Country**: The Kingdom of Cambodia
- **Organization**: The General Directorate of Policy and Strategy, Ministry of Environment
- **Name**: Chanthearith Ou, Director of Department of Science and Technology

Implementer

- **Organization**: National Institute of Green Technology (NIGT), Republic of Korea
- **Team Leader**: Gobong Choi, Senior Researcher
- **Member**: Chul-Ho Park, Principal Researcher *(Director of General)*
  Sungchan Yeom & Hyunha Shin, Senior Researcher
  Wona Lee & Heejung Shin & Eun Ju Lee, Researcher

Sep. 4th 2025, Seoul, Korea

Period & Budget

- **Period**: July 1st 2025 – June 30th 2026 (12 months)
- **Budget**: KRW 285,000,000 (around USD 190,000) funded by the Ministry of Science and ICT of Korea

Objective

- **Objective**: To establish a comprehensive National Green Hydrogen Roadmap that guides Cambodia's low-carbon development, supports national climate commitments, and unlocks opportunities for sustainable economic growth

Ⅰ. Summary

Implementer

National Institute of Green Technology

Basis for Establishment

Article 32-2 (Affiliated Institutions) of the Articles of Incorporation, Korea Institute of Science and Technology

Purpose of Establishment

Supporting the Green Technology R&D policies and Fostering International Cooperation in Green Technology

Primary Mission

Promoting the Development of the National Climate Industry and Contributing to the Global Response to Climate Change

Key Functions and Roles

01 Information Production for Policy Formulation

- Production of green technology information and statistics
- Information Platform Development and Operation

02 National R&D Policy Planning and Formulation

- National R&D project planning
- National policy (law, system) and strategy development

03 Establishment of Global Cooperation Strategies

- Establishment of cooperation and technical support system
- Development of models for overseas technology dissemination

04 Establishing/Implementing HR Development Policies

- Establishment of human resources development policies
- Planning and operation of human resource development program

The Only Policy Research Institute
among government-funded research institutes in the field of science and technology

II. Background and Objectives

A. Background

B. Objectives

A. Background

Hydrogen: Emerging as a central pillar of policy

- **Hydrogen**: a key measure for achieving carbon neutrality goals in many countries
- Many countries have established national H_2 strategies and roadmaps to guide stakeholders

< Hydrogen in the LT-LEDS* >
** Long-term Low-Emission Development Strategy*

75% of LT-LEDS
reported efforts on **hard-to-abate sectors** with advanced technologies such as ***green hydrogen***, electrification, or CCUS.

81% of LT-LEDS
reported shifting to low- or zero-carbon fuels in the **transportation sector** with **hydrogen or green hydrogen** (68%)

Source: UNFCCC (2023)

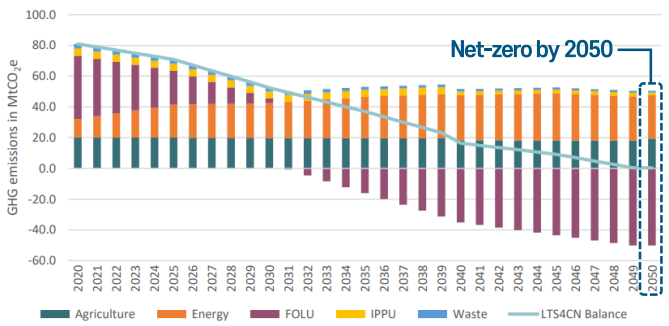
< Current Hydrogen Strategies and Roadmaps >

Source: Center on Global Energy Policy (Updated Mar. 29, 2024)

Policy foundation for H_2 is necessary in Cambodia

- As shown in LT-LEDS, Cambodia aims to achieve **carbon neutrality by 2050** and regards hydrogen as a zero-carbon fuel

< LT-LEDS Scenario of Cambodia >



Source: The Kingdom of Cambodia (2021)

- However, Cambodia has high renewable energy potential, yet **a policy foundation** for hydrogen promotion is still hard to find.

"National Hydrogen Roadmap should be established"

Support developing the roadmap via CTCN

- Strengthen a policy foundation
- Contribute to GHG reduction

B. Objectives

Objective, Outcome, and Outputs

Objective **To establish a comprehensive National Green Hydrogen Roadmap** that guides Cambodia's low-carbon development, supports national climate commitments, and unlocks opportunities for sustainable economic growth

Outcome **Strengthened national capacity** to plan, coordinate, and implement green hydrogen policies, enabling Cambodia to integrate hydrogen into its energy transition and climate strategies

Output 1

Analysis of the current status and feasibility study on green hydrogen technology

Output 2

Development of a green hydrogen roadmap concept and stakeholder consultation workshop

Output 3

Development of the National Green Hydrogen Roadmap for Cambodia

Output 4

Implementation of a capacity building program

Output 5 Additional

Development of follow-up project linkage strategies for sustainability

III. Activities and Deliverables

A. Activities at a Glance

B. Activities in Detail

A. Activities at a Glance

Mandatory Output: Project Management

Activity A	Activity B	Activity C
Beginning of Implementation	Implementation*	End of Implementation

* A project steering committee will be discussed later

Inception Workshop

- Design a workshop program
- Share the detailed project plan with NDE and others, and strengthen the collaborative partnership


Nov. 27, 2025
(Bio Green Hydrogen Refueling Station, Hydrogen Safety Museum)

Output 1

[Activity 1] Research and Analysis of Hydrogen in Cambodia

H_2 Demand Side	• [Activity 1.1] Baseline assessment of hydrogen utilization in Cambodia • [Activity 1.2] Sectoral analysis and feasibility assessment of hydrogen utilization
H_2 Supply Side	• [Activity 1.3] Assessment of hydrogen supply potential and technology options

Output 2

[Activity 2] Consultation Workshop for Stakeholders

Concept of Roadmap	• [Activity 2.1] Preparation of a concept of Green Hydrogen Roadmap
Consult-ation Workshop	• [Activity 2.2] Organization of a stakeholder consultation workshop

Output 3

[Activity 3] National Green Hydrogen Roadmap Development

- [Activity 3.1] Formulation of vision, goals, and strategic framework
- [Activity 3.2] Identification of sectoral strategies and detailed action areas
- [Activity 3.3] Establishment of phased targets, responsibilities, and monitoring mechanisms

Output 4

[Activity 4] Capacity Building and Training

- [Activity 4.1] Design of the capacity building program
- [Activity 4.2] Delivery of the capacity building program

Output 5

[Activity 5] Follow-up Project Linkage

- [Activity 5.1] Establishment of a stakeholder coordination platform
- [Activity 5.2] Identification of follow-up projects and financing opportunities
- [Activity 5.3] Preparation of a follow-up project concept note

B. Activities in Detail

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Research and Analysis of Hydrogen in Cambodia	Consultation Workshop for Stakeholders	National Green Hydrogen Roadmap Development	Capacity Building and Training	Follow-up Project Linkage

Output 1 Analysis of the current status and feasibility study on green hydrogen technology
Deliverable 1 Green Hydrogen Analysis Report

01 Research and Analysis of Hydrogen in Cambodia

① H_2 Demand Side

☑ Baseline assessment

- Benchmark global hydrogen strategies to identify **the best references for utilization**

☑ Sectoral analysis

- Identify **priority end-use sectors** through criteria (policy alignment, economic significance, technical feasibility, and energy demand)

End-use Sectors Considered in Selected Countries

☑ feasibility assessment

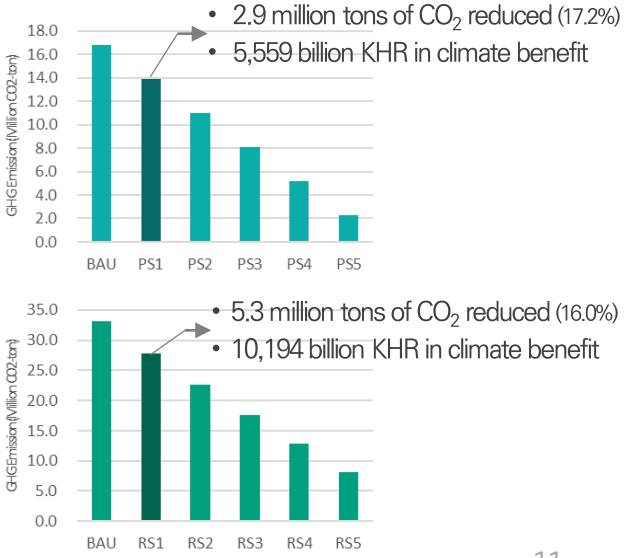
- Conduct cost-benefit or **climate benefit analysis** for the prioritized end-use sectors

Power Generation Scenario

PS1	H_2 replaces 20% of coal power by 2050
PS2	H_2 replaces 40% of coal power by 2050
PS3	H_2 replaces 60% of coal power by 2050
PS4	H_2 replaces 80% of coal power by 2050
PS5	H_2 replaces 100% of coal power by 2050

Road Transport Scenario

RS1	H_2 cars replace 20% of diesel cars by 2050
RS2	H_2 cars replace 40% of diesel cars by 2050
RS3	H_2 cars replace 60% of diesel cars by 2050
RS4	H_2 cars replace 80% of diesel cars by 2050
RS5	H_2 cars replace 100% of diesel cars by 2050



CO_2 Emission in 2050 by scenario

B. Activities in Detail

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
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Output 1 Analysis of the current status and feasibility study on green hydrogen technology
Deliverable 1 Green Hydrogen Analysis Report

01 Research and Analysis of Hydrogen in Cambodia

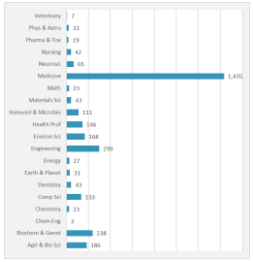
② H_2 Supply Side

☑ Assessment of hydrogen supply potential and technology options

- Review Cambodia's **renewable resource base** and **knowledge or technology resources**

- Abundant renewable energy resources, including solar and hydropower
- High potential for hydrogen production using renewable or surplus electricity

Solar PV Potential Map (Global Solar Atlas)

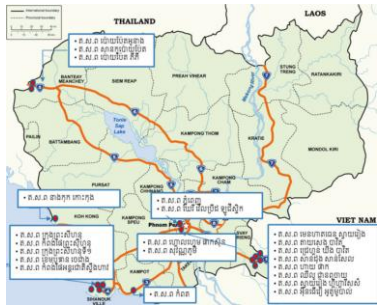


- R&D is at an early stage
- however, there is extensive experience in implementing international cooperation projects.

Number of Academic Publication by Sector (2021-2023) (Kim et al., 2024)

- Analyze **applicable production technologies**, as well as **storage and transportation options**.
- Suggest a proper site for hydrogen project

Introduction of Hydrogen Technology (NIGT, 2025)



SEZs in Cambodia (CDC, n.d.)

- SEZs are major energy demand centers, located along the Mekong River and its tributaries, with strong solar potential

B. Activities in Detail

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Research and Analysis of Hydrogen in Cambodia	Consultation Workshop for Stakeholders	National Green Hydrogen Roadmap Development	Capacity Building and Training	Follow-up Project Linkage

Output 2 Development of a green hydrogen roadmap concept and stakeholder consultation workshop
Deliverable 2 Consultation Workshop Report

02 Consultation Workshop for Stakeholders

① Concept of Roadmap

☑ Preparation of a concept of Green Hydrogen Roadmap

- Analysis of national strategies and policies
- Review International roadmap practices
- Develop a conceptual outline for the roadmap

Concept of Green Hydrogen Roadmap

☑ stakeholder consultation workshop

- A two-day workshop in Phnom Penh (Feb.24th-25th)
- Sharing the roadmap concept
- Gathering stakeholders' feedback

Consultation Workshop in Phnom Penh

B. Activities in Detail

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Research and Analysis of Hydrogen in Cambodia	Consultation Workshop for Stakeholders	National Green Hydrogen Roadmap Development	Capacity Building and Training	Follow-up Project Linkage

Output 3 Development of the National Green Hydrogen Roadmap for Cambodia
Deliverable 3 National Green Hydrogen Roadmap for Cambodia

03 National Green Hydrogen Roadmap Development

☑ Formulation of framework

- Formulate Cambodia's **future vision** to be achieved through hydrogen
- Set national **goals** to realize this vision and develop **a strategic framework**

※ The roadmap framework will be established by synthesizing the results up to Activity 2 and the inputs from Cambodia's NDE and stakeholders

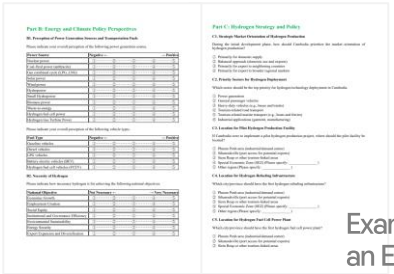
Example of Vision, Goal, and Strategies
(Case of Australia 2024)

☑ Identification of sectoral strategies

- Benchmark **leading hydrogen policies** from advanced economies and **relevant initiatives** from developing countries

※ Emphasis on renewable energy integration, foreign investment mobilization, technology transfer, and opportunities for Cambodia's participation in the global hydrogen supply chain

- Use expert consultations to ensure feasibility and alignment with Cambodia's national circumstances



Example of an Expert Survey

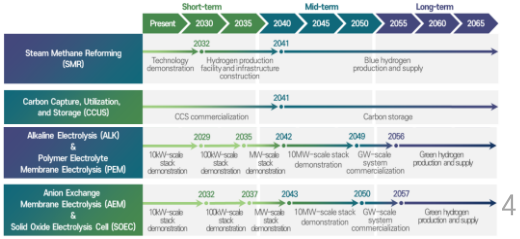
☑ Establishment of specifics

- Conduct a survey of Cambodian experts to set **phased targets**

* The survey will be conducted to Cambodian experts across government, industry, and academia

- Assign **institutional responsibilities**
- Propose **a governance framework**, including the designation of a lead coordinating body and mechanisms for periodic monitoring

Example of Phased Targets



B. Activities in Detail

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Research and Analysis of Hydrogen in Cambodia	Consultation Workshop for Stakeholders	National Green Hydrogen Roadmap Development	Capacity Building and Training	Follow-up Project Linkage

Output 4 Implementation of a capacity building program
Deliverable 4 Capacity building program report

04 Capacity Building for Officials and Experts

☑ Design of the capacity building program

Plan a two-day program in Cambodia

- Format & Duration: On-site capacity building program in Cambodia (2 days)
- Day 1 Focus: the latest information on hydrogen policies, technology trends, and roadmap development
- Day 2 Focus: financing opportunities, international project experiences, business linkage discussion

※ In coordination with Cambodia's NDE, participation will be sought from the relevant ministries and stakeholders, with attention to gender balance

☑ Delivery of the capacity building program

Deliver the program

- Present the National Green Hydrogen Roadmap developed and other valuable knowledge for hydrogen economy
- Enhance stakeholders' understanding, strengthen networks, and support roadmap implementation

Day 1 Program

Time	Agenda	Presenter
09:00–09:30	❑ Opening & Welcome Remarks	NIGT/ NDE
Session 1 09:30–11:30	❑ Introduction of CTCN TA Project & NIGT	NIGT
	❑ Presentation & Discussion on the National Green Hydrogen Roadmap	NIGT/ Participant
11:30–13:00	❑ Lunch & Networking	-
Session 2 13:00–15:00	❑ Hydrogen Policy Trends in Korea & Major Countries	NIGT
	❑ International Hydrogen Cooperation Landscape & Strategies	NIGT
	❑ Latest Trends in Hydrogen Technology Development	NIGT / Experts
15:00–15:20	❑ Closing	NIGT/ NDE

B. Activities in Detail

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Research and Analysis of Hydrogen in Cambodia	Consultation Workshop for Stakeholders	National Green Hydrogen Roadmap Development	Capacity Building and Training	Follow-up Project Linkage

Output 5 Development of follow-up project linkage strategies for sustainability
Deliverable 5 Follow-up Project Linkage Strategy Report, Draft concept note(s) for financing institution

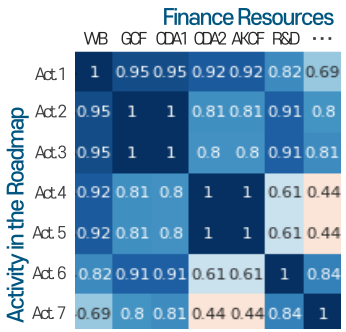
05 Follow-up Project Linkage

Establishment of a stakeholder coordination platform → Identification of follow-up projects and financing opportunities → Preparation of a follow-up project concept note → Ensuring the Sustainability of TA project

- Form **a coordination platform** consisting of ministries, universities, research institutes, international organizations, and KOICA representatives
- Share results, validate priorities, and ensure national ownership of follow-up initiatives

- Extract **actionable follow-up projects** from the National Green Hydrogen Roadmap
- Match them with relevant domestic and international **climate finance resources**

Example of Activity-Finance Resource Matching



- Develop **concept notes** for selected follow-up projects, with a particular focus on GCF Readiness and other climate finance programs

Example of a GCF Concept Note

IV. Follow-up Project (draft)

A. Concept A

B. Concept B

C. Concept C

Irrigation Dams + Small Hydropower + Floating Solar PV

00 Draft Concept for the Follow-up Project

Concept A Green Hydrogen Demonstration based on Irrigation Dams in Battambang

☑ Site Description

- **Location:** Battambang Province
- **Current Status:** Irrigation dams currently *without power generation* → Potential for integrated deployment of *small hydropower* and *hydrogen production facilities*
- **Cooperation Base:** *MOU* signed (Nov 2024) between ***K-water** (Rep. of Korea)* and the ***MOWRAM*** for *renewable energy development* at 16 irrigation dams
- **Hydropower Potential:** Estimated 2-5 MW at Dauntri Dam

No need to renegotiate the existing PPA (Power Purchasing Agreement)

Pursuing linkage with ITMO mechanisms (internationally Transferred Mitigation Outcomes)

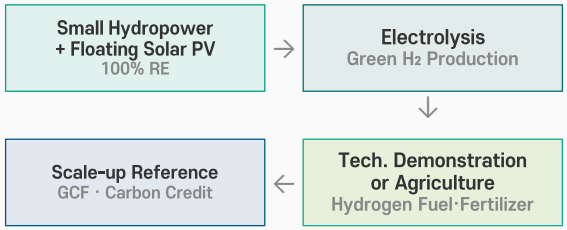
Battambang Province (Google Map)

Hydrogen Production using Small Hydropower in Korea(K-Water) (E2NEWS, Jul. 2025)

☑ Objectives and Project Structure

- **Objective:** Demonstration of *green hydrogen* based on ***small hydropower** during the wet season + **floating solar cluster** during the dry season*
  ※ *Water as feedstock: 20-30kg of H_2O → 1kg of H_2 → 100km driving (Hyundai)*
- **Supply:** Small Hydropower + floating solar PV in parallel → 100% renewable electricity supplied to the hydrogen production facility *(Green Hydrogen)*
- **Demand:** *(1st) Policy and technology demonstration* → (2nd) Local agricultural community → (3rd) Scale-up reference model for GCF or carbon credit

Project Structure Flow



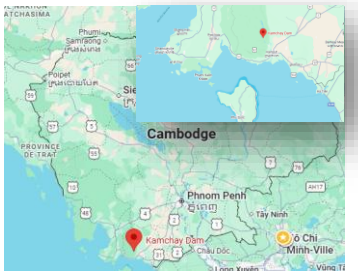
Hydropower + Reclaimed Water → H_2 → NH_3

00 Draft Concept for the Follow-up Project

Concept B Kampot Hydrogen-Agriculture Integration Model: Green Ammonia Self-Sufficiency

☑ Site Description

- Location: *Kamchay hydropower plant* and adjacent *wastewater treatment plant (WWTP)*
- Geographical Feature: Agricultural zone (pepper, durian) adjacent to the dam — *enabling short supply chains*
- Key Indicator: Availability of wet-season surplus power (curtailment) data
- Water Resources: ***Reclaimed WWTP water*** as electrolysis feedwater → *Integrated water-energy nexus*
  - → Low need for additional water supply
    However, water quality testing is required

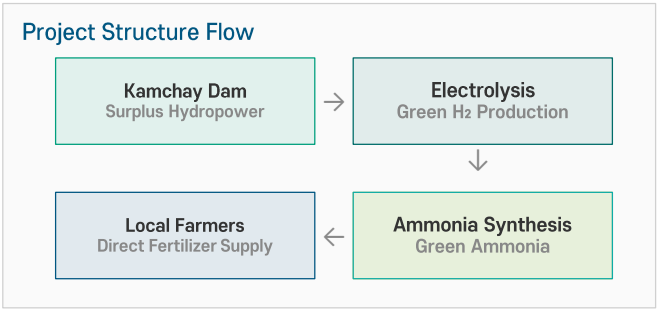


Kamchay Dam (Google Map)


Kamchay Dam
(Fresh News Asia, Jul. 2018)

☑ Objectives and Project Structure

- Objective: Convert otherwise curtailed hydropower into *green ammonia*, driving innovation across Cambodia's agricultural value chain
- Supply: ***Surplus hydropower*** + treated WWTP effluent → *green hydrogen (H_2)* production via electrolysis
  - → Hedging strategy required during the dry season (e.g., floating solar PV or grid connection)
- Demand: H_2 + N_2 → ammonia (NH_3) synthesis → ***fertilizer supply to agricultural cooperatives***, enhancing food security
  - → Benefit-sharing with local farmers



C. Concept C

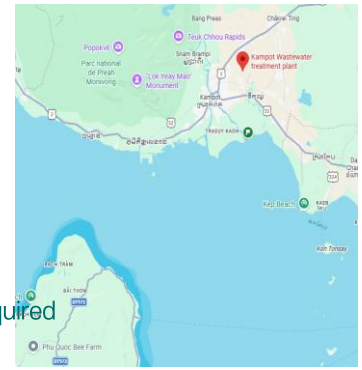
Hydrogen Economy + Ecotourism

00 Draft Concept for the Follow-up Project

Concept C Kampot Hydrogen-Tourism Integration Model

☑ Site Description

- **Location:** *Trapeang Sangkae Mangrove Conservation Area* and adjacent *Kampot International Tourist Port*
- **Infrastructure:** Newly constructed ***wastewater treatment plant*** (Dec. 2023) – Optimal site for ***biogas production***
  → The current system is lagoon-based → Installation of an anaerobic digester is required
- **Geographical Advantage:** Hydrogen production site (WWTP) and tourism hubs (port/mangrove area) located *within a 10 km radius* → *minimized transport costs* and enhanced system efficiency



WWTP and Port (Google Map)

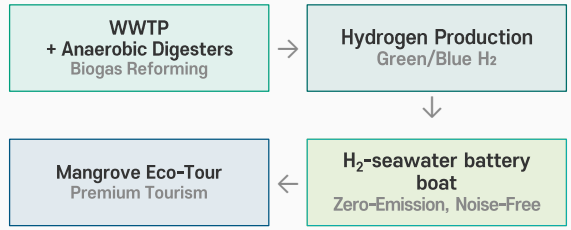
H_2 Production from Biogas in Korea (Monthly H2 Economy, Jan. 2022)


H_2-Seawater Battery Boat in Korea (KIOST, Feb. 2022)

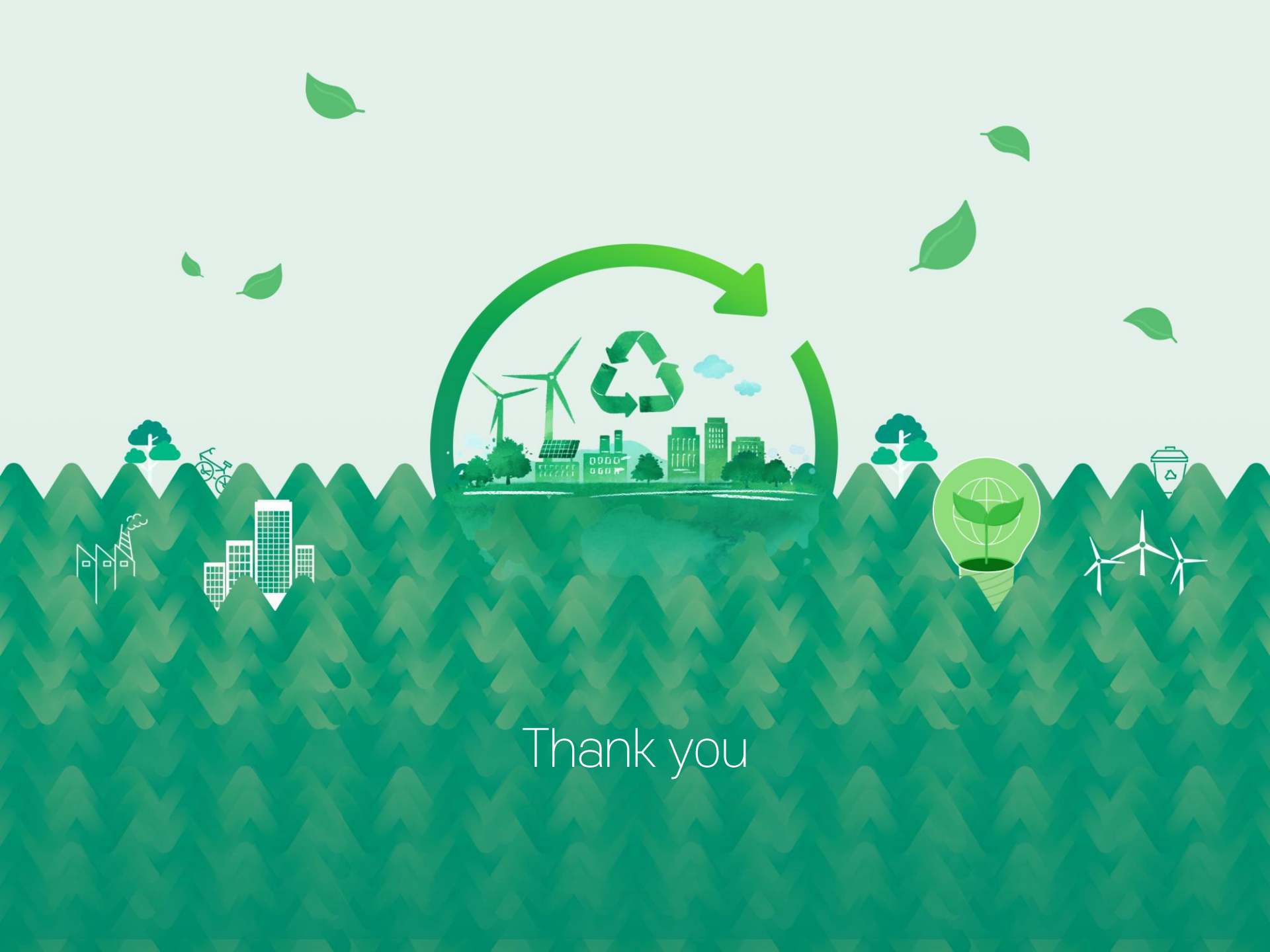
☑ Objectives and Project Structure

- **Objective:** Establish Southeast Asia's first *"Waste–Hydrogen–Eco-Tourism"* circular model
- **Supply:** Installation of anaerobic digesters at the WWTP → biogas reforming → hydrogen production
- **Demand:** Operation of *hydrogen–seawater battery hybrid boats* for *premium mangrove eco-tours*, targeting European and North American visitors

Project Structure Flow



※ Lagoon system: a pond-based wastewater treatment method relying on natural biological processes; typically does not capture biogas.
※ Anaerobic digester: captures methane from wastewater and converts it into usable biogas energy.


Thank you