COUNCIL OF AGRICULTURE
EXECUTIVE YUAN

Taiwan 2050 Net-Zero Transition

Carbon sinks

2023.3

COUNCIL OF AGRICULTURE
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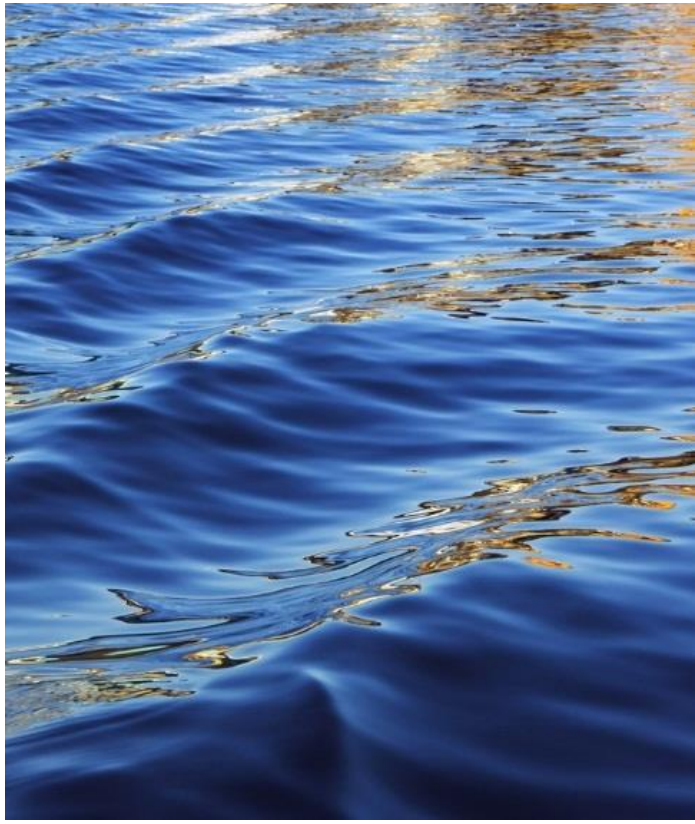
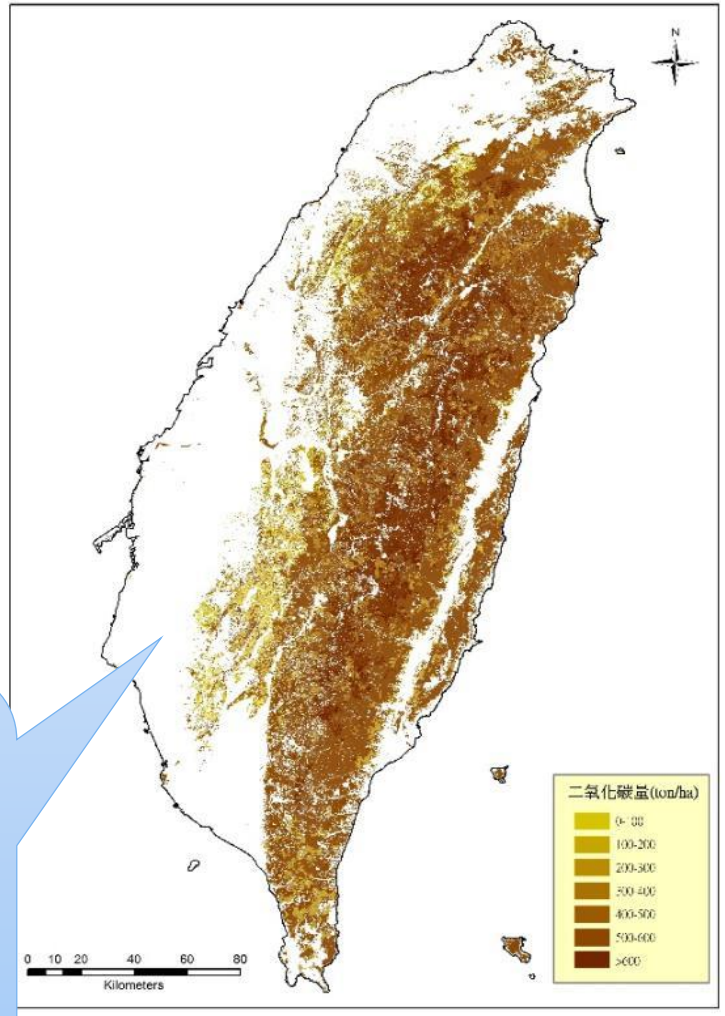


Taiwan’s 2050 Net-Zero Transition

Background and Challenges

- According to the National Greenhouse Gas Inventory Report (NIR), forestry sector removes over **22 million metric tons of CO_2 annually**, which is about **7.6% of the country's total emissions**.
- However, there is not enough baseline data on soil and marine for NIR.



- There are **2.2 million hectares** of forests in Taiwan, which is approximately **60% of Taiwan's overall landcover**.
- The total forest stock volume is 502 million cubic meters, which can be converted into **754 million metric tons** of total carbon storage.

● Goals and Pathways

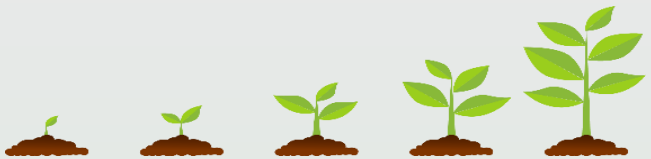
- By 2040, the goal is to remove 10 million metric tons of CO_2.
- The primary pathway is to develop solutions for carbon dioxide removal (CDR) by nature, with the focus on technology to enhance carbon sink & sequestration in forest, soil and marine environments.

Forest

Soil

Marine

Strategies and Actions (1/12) Forest



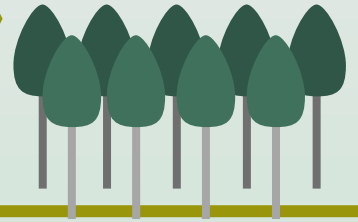
- Improving timber self-sufficiency
- Promoting the use of domestic woods
- Reusing the remaining woods and bamboo materials

Utilizing Domestic Timber

Increasing Forest Coverage

- National and coastline forests
- Overused lands
- Low or non-profits farmland
- Hydraulic engineering areas

Enhancing Forest Manage-ment



- Forest and bamboo management
- Cultivation of low-volume and degraded stands
- Revitalizing aging bamboo forest

Strategies and Actions (2/12) Forest

1 Increasing forest coverage

- Afforestation on slopeland and low or non-profits farmland
- Promoting the agroforestry and under-forest economy, increase the income and willingness of participation in afforestation.
- Promoting the urban forests, increasing the benefits of carbon sink and optimizing the ecological environment

Goal by 2030

- Afforestation areas reach 12,600 hectares
- Increase about 107,000 metric tons of CO_2 per year

Strategies and Actions (3/12) Forest

2 Enhancing forest management

Goal by 2030

- **Forest management areas reach 16,400 hectares**
- **Bamboo management areas reach 30,000 hectares**
- **Increase about 454,000 metric tons of CO_2 per year**

Reforestation of degraded forest

- Alien species removal
- Degraded coastline reforestation

Forest management

- Pruning and thinning of artificial forests that older than 7 years
- Accelerating the growth of forest
- Increasing carbon storage of forest

Bamboo management

- Proper management makes bamboo high carbon sequestration capacity
- Strengthening bamboo industry income and business activities

Strategies and Actions (4/12) Forest

3 Utilizing domestic timber

to substitute the timber imports

- From **2009** to **2018**, the average import of timber was about **5** million m^3 per year, **36%** of which may came from illegal logging.
- Reducing carbon emissions in long-distance timber transportation
- Revitalizing the forestry industr.

Goal by 2030

- Timber production **200,000** m^3
- Increase about **197,000** metric tons of CO_2 carbon stock

台灣木材
TAIWAN WOOD

Strategies and Actions (5/12) Forest

3 Utilizing domestic timber

Developing bamboo industry

bamboo
⬇
glued-laminated timber
⬇
building materials and furniture

Wood and Bamboo materials turn into bioenergy

Waste Bamboo from Bamboo Renewal

Crushing/Drying/ Carbonization

Bamboo Charcoal

bamboo vinegar

heating hot spring water

Various Uses of Domestic Timber

The **TDIS team** from **National Yang Ming Chiao Tung University** won the **"Solar Decathlon Europe 2022"** by using domestic timber to build the sustainable housing.

Chishang Train Station

Musical Instrument

Traditional Taiwanese House - 1 House for All

Civil Engineering Works in Forest

Interior Decoration

Wooden Floor

Strategies and Actions (6/12) Soil

Growing crops in Greenhouse

Enhancing Soil Management

- Develop effective soil management techniques to increase soil organic matter
- Determine assessment, analysis, and the potential distribution patterns of carbon stocks
- Investigate Taiwan MRV mechanism of soil carbon sequestration

Carbon-negative Farming Approaches

- Promoting carbon-negative crop varieties
- Developing carbon-negative cultivation techniques
- Reusing agricultural resources and apply good microorganisms to increase soil organic matter

Burying the harvested straws

Growing crops in Greenhouse

MRV: monitoring, reporting and verification

● Strategies and Actions (7/12) Soil

1 Enhancing soil management

◆**Exploiting soil carbon sequestration technology**: Establishing the domestic soil carbon **MRV mechanism** and soil carbon **sequestration practices** .

2 Carbon-negative farming approaches

◆**Encouraging carbon-negative cultivation:** such as vegetation, greenhouse, green manure, no-till farming, etc. This will be done on **119,000** hectares of land, and will remove **199,000** metric tons of CO_2 from the air by 2030.

◆ **Reusing agricultural remaining resources and applying befitting microorganisms:** This will be done on 300,000 hectares of land and will remove **60,000** metric tons of CO2 from the air by 2030.

vegetation cultivation

Application of biochar

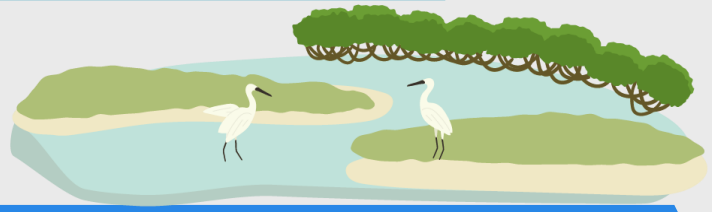
leguminous crops

Strategies and Actions (8/12) Marine

- Developing new IMTA systems for increasing carbon storage
- Evaluating carbon sink benefits

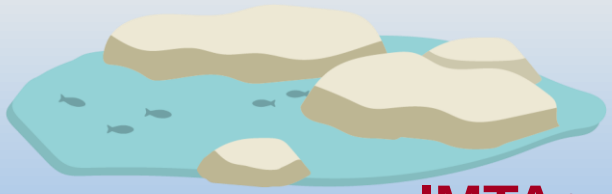
Establishing MRV methodology

- Establishing carbon sink baseline data and emission factors for ocean and wetland
- Monitoring carbon storage



Restoration of aquatic plants

- Restoring aquatic plants and estimating their carbon sequestration
- Managing models of carbon storage improvement



Developing new IMTA systems

IMTA: Integrated Multi-trophic Aquaculture System

Strategies and Actions (9/12) Marine

1 Establishing MRV methodology

(1) Enhancing native macrophyte cultivation

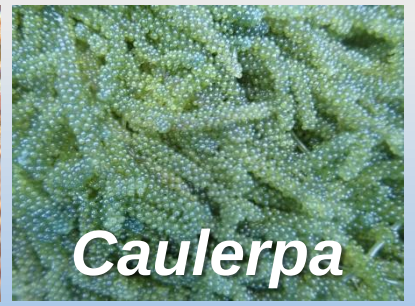
- Breeding native macrophyte that increases carbon sinks
- Measuring plant activity and efficiency in ecological habitats with underwater acoustics
- Evaluating carbon budget

(2) Establishing techniques for measuring marine and wetland carbon sinks

- Establishing methodologies for the measurement of carbon sinks in marine and wetland habitats
- Establishing local carbon sink coefficients and ocean carbon sink baseline data

(3) New technologies to enhance marine carbon sinks

- Developing environmental management systems and monitor technologies
- Enhancing primary productivity of ecosystems
- Expanding carbon fluxes and CO_2 cycling in marine systems to enhance carbon sinks
- Conducting in-situ experiments to set up optimal parameters for control systems



Enhancing native macrophyte cultivation with carbon sink benefits

Strategies and Actions (10/12) Marine

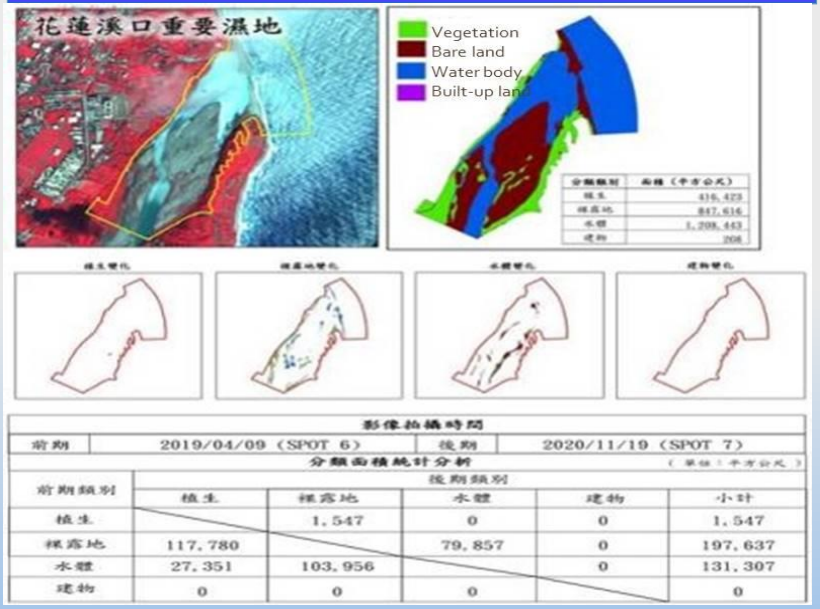
Maintaining and managing wetlands & increasing the area of wetland conservation

- increase 5 ha by 2030
- increase 10 ha by 2050

Not only to ensure the natural carbon sink function but also to adapt to climate change

Adding wetland carbon sink functions and mechanisms to The National Wetland Conservation Guide

Redesigning wetland conservation plan from the perspective of increasing carbon sink



前期	2019/04/09 (SPOT 6)		後期	2020/11/19 (SPOT 7)
前期類別	後期類別			
	植生	裸露地	水體	建物	小計
植生		1,547	0	0	1,547
裸露地	117,780		79,857	0	197,637
水體	27,351	103,956		0	131,307
建物	0	0	0		0

Providing subsidies to increase wetland restoration area

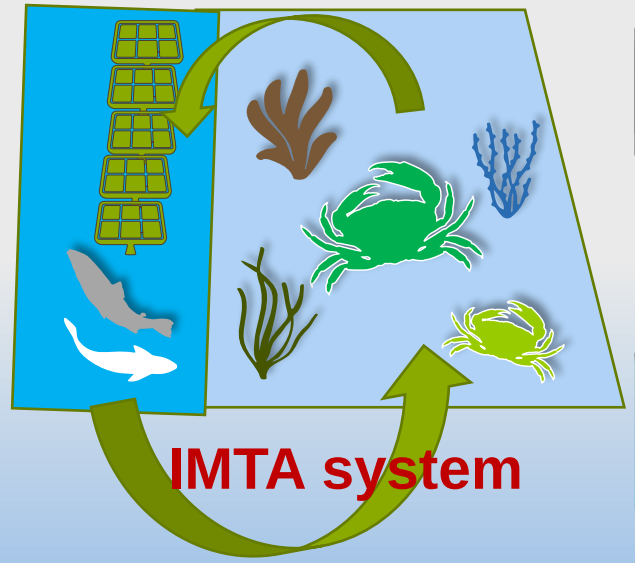
Strategies and Actions (11/12) Marine

2 Developing new IMTA systems

Strategies

- Developing new IMTA systems for increasing carbon storage
- Identifying indicators for evaluating carbon sink benefits
- Cost assessments of carbon sink technologies for multitrophic aquaculture systems and aquavoltaics

Shellfish, fish, and algae mixed -aquaculture



large algae aquaculture

Strategies and Actions (12/12) Marine

3 Restoration of aquatic plants

Strategies

◆**Investigation, analysis and restoration mangroves and seagrass beds**

- Historical distribution changes and area of habitats
- Seasonal database of dominant species.
- Carbon absorption and storage capacity of plants and soil, as well as greenhouse gas emissions from soil.
- Inventory and estimate the carbon sinks of the potential restoration sites.
- Case studies of restoration and management.

Seagrass-transplant

Seagrass bed

Benefits

◆ **Enhancing marine carbon sink by increasing and maintaining the restoration area of mangroves, seagrass beds and wetlands**

◆ **By 2030, The restoration areas will be up to 6,325 hectares, and increasing about 340,000 metric tons CO_2 e**

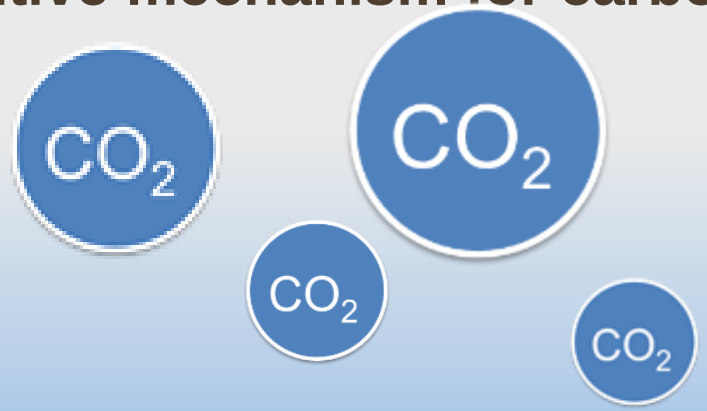
◆ **Carbon sinks of seagrass beds: 270,000 metric tons/year;**
mangroves: 64,000 metric tons/year;
salt marshes: 6,000 metric tons/year

Seagrass

Research and Development

To enhance carbon sequestration efficiency, the objectives of research are to develop technology in the three major pathways (forest, soil and marine) before 2050.

- **Improving the National Greenhouse Gas Inventory Report**
- **Developing innovative technology of increasing carbon sink**
- **Promoting the management of conservation**
- **Establishing methodology and incentive mechanism for carbon credits conversion**



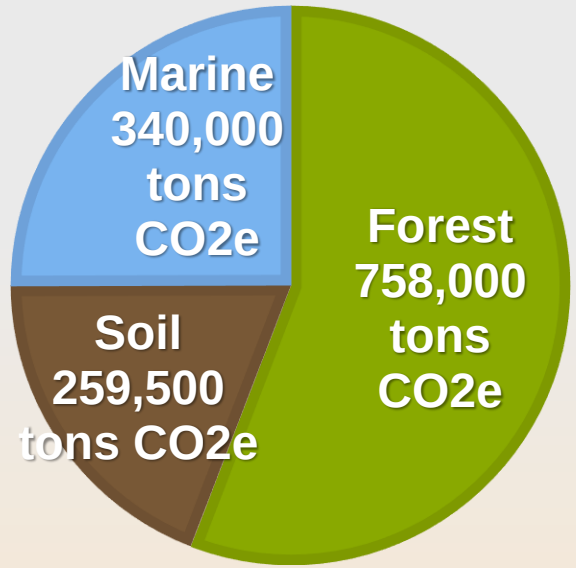
● Expected Benefits

Marine carbon sequestration:
340,000 metric tons CO_2e by 2030

Forest carbon sequestration :
758,000 metric tons of CO_2e by 2030

Soil carbon sequestration :
259,500 metric tons of CO_2e by 2030

Carbon sequestration
1,357,500 metric tons of co_2e by 2030



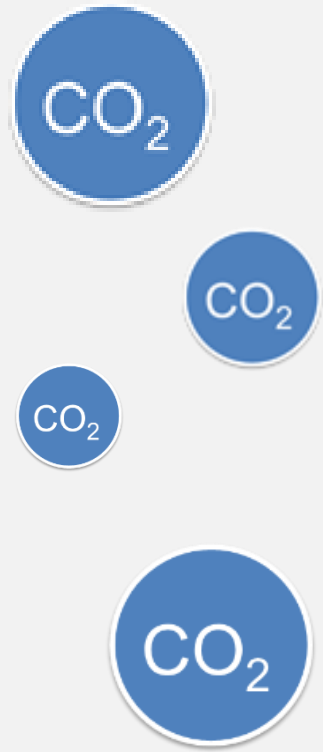
Just Transition

Establish sharing mechanism for carbon sink value

- Protecting the rights of all people while protecting wetlands, oceans and forests.
- Establishing a carbon sink value sharing mechanism through a variety of resources, such as carbon credit mechanisms, incentives and subsidies, agricultural ESG promoting programs, etc.

Conclusions

Through the implementation of carbon sink practices, the agricultural sector can contribute to the national goal of NET ZERO emissions.



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Thank you for your attention

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