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Report Name: Taiwan Climate Change Overview

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Report Highlights:

This report contains an overview and summary, with links to relevant resources, of Taiwan’s climate change legislation, action plans, guidelines, renewable energy goals, biofuels policy, and adaptation strategy. Taiwan enacted the Greenhouse Gas Reduction and Management Act in 2015, setting a goal to reduce 50 percent of carbon emission below 2005 level by 2050. In October 2021, it proposed a draft amendment which would strive for “net zero” emissions by 2050 as well as stipulate a carbon fee for emission. Agricultural greenhouse gas (GHG) emissions only account for 1 percent of Taiwan’s total emissions. Ag-focused measures to reduce GHG emission consist of expanding sustainable farming, utilizing biogas in livestock farms, and reforestation. Taiwan does not have a history of producing biofuel crops and faces a significant uphill battle to adopt a biofuels mandate in transportation.

Part 1. Climate Change Legislation

Taiwan is not a member of the United Nations; thus, it is not able to participate in the Intergovernmental Panel on Climate Change (IPCC), the United Nations Framework Convention on Climate Change (UNFCCC), or the resulting Kyoto Protocol and Paris Agreement. Nevertheless, it has strived to enact comparable legislation to fight climate change.

Greenhouse Gas Reduction and Management Act

On June 15, 2015, Taiwan's Legislative Yuan passed the [Greenhouse Gas Reduction and Management Act](#) which was promulgated by presidential order on July 1, 2015.

The Act is the first law in Taiwan to set a legal basis for domestic measures to mitigate and adapt to climate change following the spirit of the UNFCCC while modeled on the UK's Climate Change Act of 2008. Taiwan's Greenhouse Gas Reductions and Management Act:

- Stipulates a mandatory greenhouse gas (GHG) emissions reduction target of 50 percent below 2005 levels by 2050.
- Introduces an emissions trading scheme, an energy tax, and other reliable instruments to boost Taiwan's transition to a low-carbon economy which would complement the Renewable Energy Development Act and the Energy Management Act.
- Designates EPA to be the central competent authority responsible to mitigate climate change.
- Underscores the importance of adaptation and financing in the face of climate change.

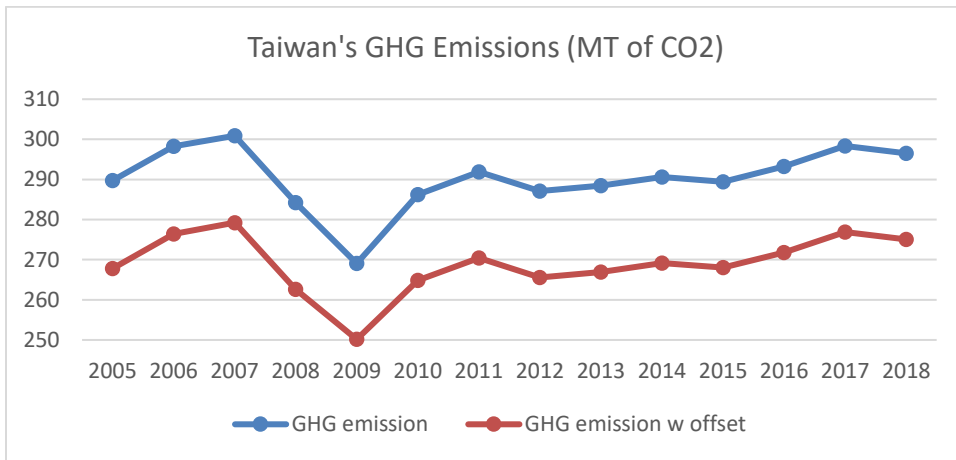
The definition of GHG includes: Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydro fluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), nitrogen trifluoride (NF₃), and others. In 2018, 95 percent of GHG emissions were CO₂.

Figure 1: Taiwan's Phased GHG Reduction Targets

GHG Reduction Target (base year 2005)		
1st phase	2016-2020	2% reduction versus 2005
2nd phase	2021-2025	10% reduction versus 2005
3rd phase	2026-2030	20% reduction versus 2005

A detailed English summary of the act can be found [here](#).

Figure 2: Taiwan GHG Emissions, 2005-2018

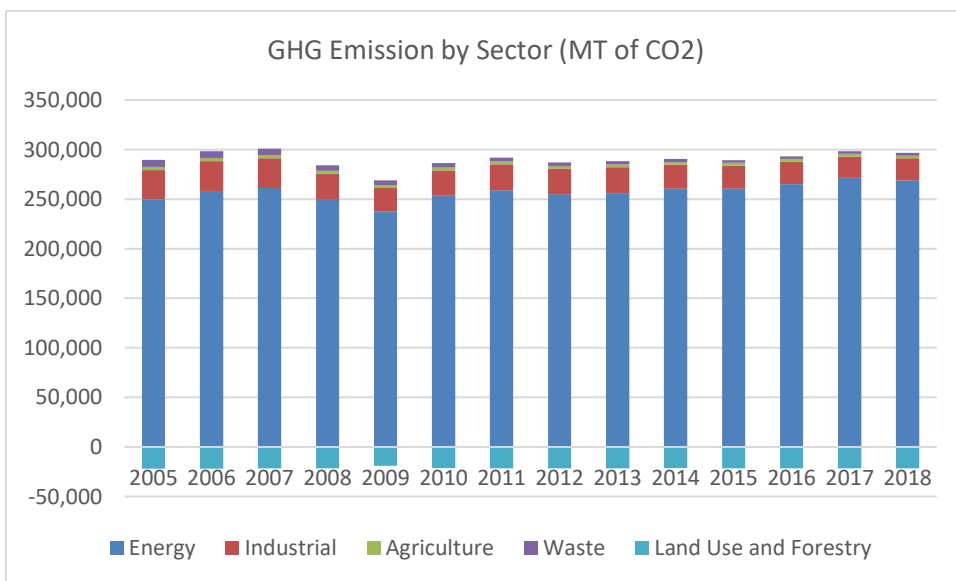


Source: EPA

Agriculture and GHG Emissions

The Act stipulates the goal of reducing and managing GHG emissions from agriculture while guaranteeing food security. The most recent available data (from 2018) showed agricultural activity only accounted for one percent of total GHG emissions in Taiwan.

Figure 3: Taiwan GHG Emissions by Sector



Source: EPA/National Greenhouse Gas Inventories

Agricultural GHG emissions reduction measures include:

- (1) Increasing the area of organic and environmentally friendly farming to 15,000 HA in 2020 and 22,500 HA in 2025.
- (2) Advocating the reuse of biogas in livestock farms for power generation, with the number of animals reaching 50 percent of total livestock (estimated 2.5 million animals) in 2020 and 75 percent in 2025 (estimated 3.75 million head)
- (3) Increasing the area of reforestation. 3,636 HA of afforestation to be completed in 2020 and 7,176 hectares to be completed in 2025.

A summary of GHG reduction measures in other sectors can be found [here](#).

Proposal to Amend the Act in 2021

In 2021, Taiwan EPA proposed to [amend the Act](#) to include stipulations regarding carbon reduction measures that are to be implemented by different agencies along with their climate change adaptation responsibilities.

Additionally, EPA is establishing a central climate change adaptation reporting mechanism, imposing GHG emission management fees after referencing international carbon pricing practices, and establishing an economic incentive system.

EPA will also develop low-carbon technologies with the GHG Management Fund to promote a low-carbon economy.

Other amendments to the Act include: revising the GHG emission performance standard (EPS) to enhance regulatory quality; adding new regulations on climate change adaptation and the required adaptation measures; and establishing climate resilience systems for the government at all levels.

The draft of the proposal can be found [here](#) (Chinese only).

On October 21, 2021, EPA formally announced the [amended draft](#) for 60 days of public comment, which would change name of the Act to the Climate Change Response Act. It sets a more ambitious target of net zero emissions by 2050, clarifies the responsible agencies while stipulating the National Council for Sustainable Development (NCSA) to coordinate and consolidate policies and reporting, and introduces carbon pricing.

The LY is expected to take up the draft act during the next session in February 2022. However, since the Act mainly serves as a set of guidelines, actual mitigation/adaptation plans might need to be drafted separately once the Act is amended.

Part 2. Climate Change Action Guidelines and Plan

National Climate Change Action Guidelines

Based on Article 9 of the 2015 Greenhouse Gas Reduction and Management Act, Taiwan EPA drafted the “National Climate Change Action Guidelines” which were approved by the Executive Yuan on February 23, 2017.

The guidelines include climate change adaptation, mitigation, and complementary policies:

- Climate Change Adaptation
 1. Enhance disaster risk evaluation and disaster management
 2. Raise resilience of infrastructure
 3. Maintain a balance between water supply and demand
 4. Assure land use safety and strengthen land consolidation and management mechanisms
 5. Prevent coastal hazards and ensure sustainability of marine resources
 6. Improve adaptability of the energy supply system and industries
 7. Secure agricultural production and ensure biodiversity
 8. Reinforce the public health and epidemic prevention system and improve health risk management

- Climate Change Mitigation
 1. Adjust the energy supply structure and improve energy efficiency
 2. Transform to green business and execute sustainable production and consumption strategies
 3. Develop green transportation and improve energy efficiency of the transportation system
 4. Construct sustainable buildings and low carbon living areas
 5. Boost the development of sustainable agriculture
 6. Alleviate environmental burdens and build a society that reuses and recycles energy and resources

Further information in English can be found [here](#).

National Climate Change Adaptation Action Plan

The National Climate Change Adaptation Action Plan (2018-2022) was compiled by 16 ministries of the Executive Yuan. It contains action plans for nine sectors, including disaster, infrastructure, water resource, land use, coastal and marine environment, energy supply and industry, agricultural production and biodiversity, public health, and capacity building.



Image Credit: Taiwan Adaptation Platform, [TAP](#)

Action Plan for Agricultural Production and Biodiversity

The plan will strengthen long-term monitoring and early warning mechanisms, consummate natural disaster relief and insurance systems, integrate technology to enhance the resilience of the agriculture, forestry, fishery, and animal husbandry industries, and carry out species and gene preservation to ensure food security and maintain biodiversity.

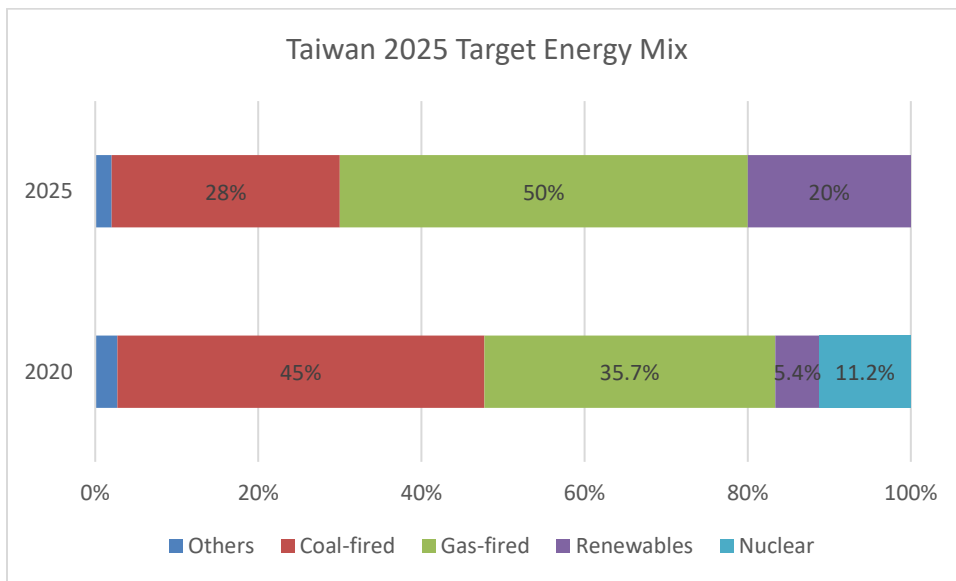
- Goals:
 1. Maintain agricultural production resources and the environment
 2. Develop climate-smart agricultural technology
 3. Adjust the agricultural business model and strengthen the early warning and adjustment mechanism of production and sales
 4. Establish a disaster warning and response system
 5. Strengthen the agricultural disaster relief and insurance system
 6. Regularly monitor and strengthen the management of protected areas to maintain biodiversity

Detailed strategies and measures as well as specific projects can be found [here](#) (Chinese only).

Part 3. Renewable Energy

Taiwan's [Renewable Energy Development Act](#) was last amended in 2019. It set a goal for renewable energy sources to reach [27 gigawatts](#) (GW) of capacity by 2025. It aims for Taiwan to be a nuclear-free country by 2025, with 20 percent of its power supply derived from renewable sources. The expansion in renewables will be mainly from solar and offshore wind installation.

Figure 4: Taiwan Target Energy Mix (2020 vs. 2025)

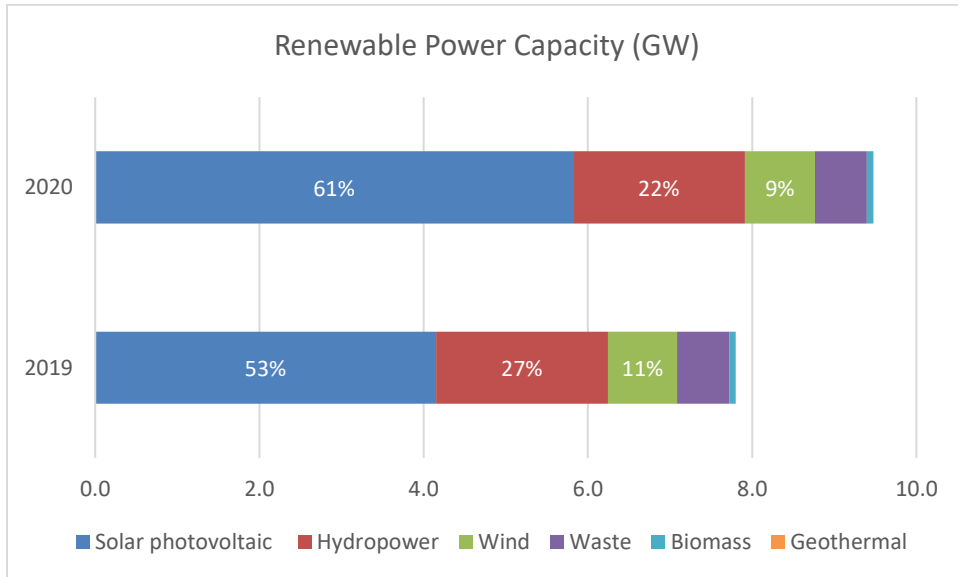


Source: Environmental Information Center

According to [Tai-Power](#), the current capacity of renewable energy installations is 9.47 (GW), of which solar photovoltaic makes up 5.82 GW, hydro is 2.09 GW, wind is 0.85 GW, waste 0.63 GW, biomass 0.08 GW, and geothermal is 0.3 GW.

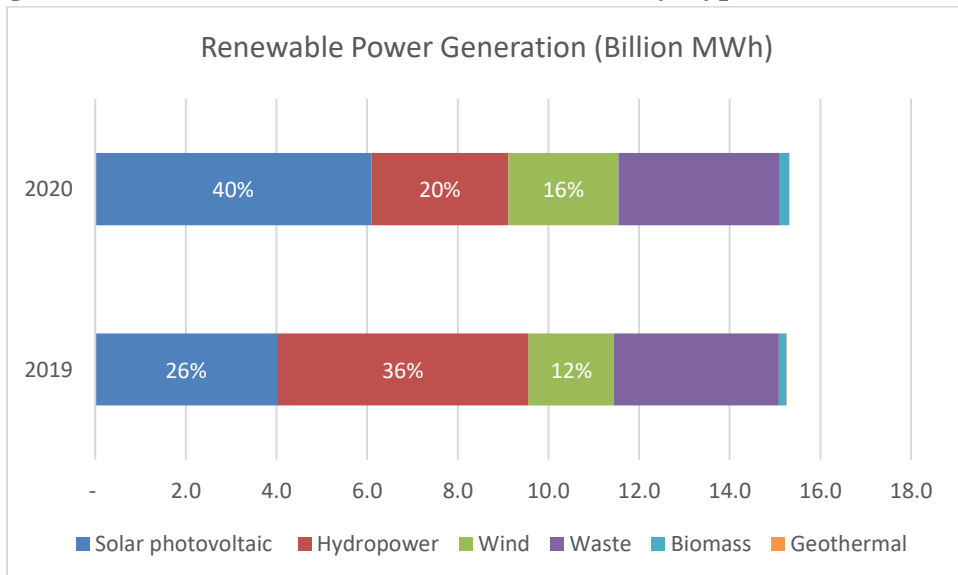
Due to draught and water shortage in 2020, hydropower underperformed in generation. Further analysis of Taiwan's 2020 power generation can be found [here](#).

Figure 5: Taiwan Renewable Power Capacity by Type (in GW), 2019-2020



Source: Bureau of Energy, MOEA/ Tai-Power

Figure 6: Taiwan Renewable Power Generation by Type (in Billion MWh)



Source: Bureau of Energy, MOEA/ Tai-Power

Part 4. Biofuels in Transportation

Taiwan currently has no mandate for biodiesel or ethanol.

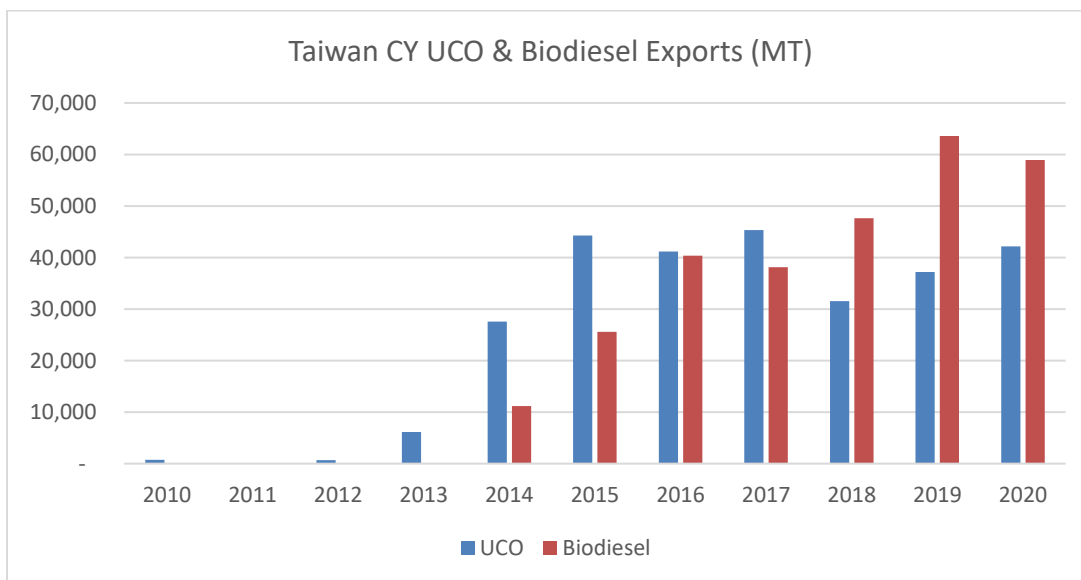
Biodiesel

In 2008, Taiwan implemented a B1 mandate, which was later upgraded to a B2 mandate in 2010. However, Taiwan completely phased out its B2 biodiesel mandate in 2014 due to opposition from downstream gas stations and the touring car industry. The opposition stemmed from concerns over Taiwan's humid climate leading to microbes clogging fuel tanks, for which many believed the 2 percent biodiesel content was to blame.

Biodiesel had been produced by used cooking oil. During 2013-14, there were highly publicized vegetable oil scandals including one involving the [repurposing of gutter oil](#) for human consumption, leading EPA to tighten control on collection and distribution of used cooking oil. Since then, most of the used cooking oils are either exported directly or as ingredient for soap and biodiesel destined for other countries. The responsibility to regulate used cooking oil was transferred to TFDA in 2017.

More background information regarding Taiwan's biodiesel producers can be found in this Taipei Times 2014 [feature](#) and CW's 2019 [report](#).

Figure 7: Taiwan Used Cooking Oil and Biodiesel Exports (in MT)



HS Code: UCO 15180050 & 15180090 / Biodiesel 381600

Source: TDM & Taiwan Customs

Ethanol

Since 2017, Taiwan has had a limited pilot program for E3 ethanol gasoline in 14 CPC (China Petroleum Corporation, Taiwan's state-owned energy company) [gasoline stations](#) in Taipei and Kaohsiung, done in collaboration between CPC and Tai-sugar. However, Taiwan's prospects for adopting an ethanol mandate remains slim.

Ethanol gasoline faces significant obstacles including:

- Both oil refiners CPC and Formosa are methyl tert-butyl ether (MTBE) producers as an extension of their refinery process. The introduction of ethanol into the gasoline pool will directly compete with their MTBE production.
- Taiwan does not produce any significant crops that can be made into ethanol. Although there have been proposals to grow biofuel crops in fallowed farmland, it would not be economically viable without major subsidies.
- Since imports would likely be required to fulfill the mandate, the government has less incentive to pursue such a policy and fend off domestic consumer opposition.

As a result, there is currently no strong drive for an ethanol mandate solely on the prospect of reducing GHG emissions. GHG reduction measures in transportation are instead focused on increasing fuel efficiency and encouraging electric car and fuel cells development. The electric scooter brand Gogoro is a good [example](#) of this policy.

Part 5. Adapting to Climate Change

As mentioned in previous reporting on Taiwan's 2020-21 drought([TW2021-0037](#)), Taiwan faces multiple challenges from global climate change and global warming. Shifting weather patterns will likely cause extreme weather events to become more frequent.

Drought and water availability have a significant impact not only on crop productions but also on hydropower electricity generation. Limited water resources also pit agriculture and industry against each other.

Finding a solution that balances electricity generation between traditional and renewable energy sources while ensuring a reliable energy supply will be critical if Taiwan is to maintain its edge in the semiconductor industry.

In addition to making GHG reductions a goal, Taiwan will also need to seriously examine how to better prepare for extreme weather and enhance its climate resilience.

Following the August 2021 publication of the IPCC's 6th Assessment Report ([AR6](#)), Taiwan's Climate Change Science [Team](#), launched by the Ministry of Science and Technology (MOST) in 2010, has updated its climate change [projection](#) based on the new data. It forecasts that Taiwan will continue to experience higher temperatures, more extreme weather events, and even shorter winter seasons by the middle and late 21st century, which may eventually impact the growing season and domestic crop production.

On September 1, 2021, Taiwan's Council Of Agriculture (COA) established a Climate Change Adaptation and Net Zero Emissions Project Office (氣候變遷調適及淨零排放專案辦公室) to coordinate climate change adaptation policies related to agriculture. Dr. Lao-Dar Juang, Director General of the Department of Planning, will be the first executive officer for the office.

COA has identified five areas as the main focus: climate change adaptation, carbon reduction, agricultural carbon sink, agricultural green energy (solar energy, small hydropower), and circular agriculture. Current projects in the agriculture sector include reforestation to generate carbon sink, achieving zero net carbon emissions by installing solar panels on farmland, reusing agricultural waste for power generation, as well as working on climate resilient agriculture and agricultural disaster insurance schemes.

COA aspires to have an NT\$ 10 billion annual budget for climate adaptation versus the current NT\$ 4.5 million/year. For comparison, Japan, whose agricultural production is 5-6 times larger than Taiwan's, has an annual budget of around NT\$ 50 billion for climate adaptation.

Attachments:

No Attachments.