



The Bio-Circular-Green (BCG) economy model in Chinese Taipei

**Bureau of Energy
Ministry of Economic Affairs**



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Outline

- ❑ BCG in Chinese Taipei
- ❑ BCG model
- ❑ RE Policies on BCG
- ❑ Concluding Remarks

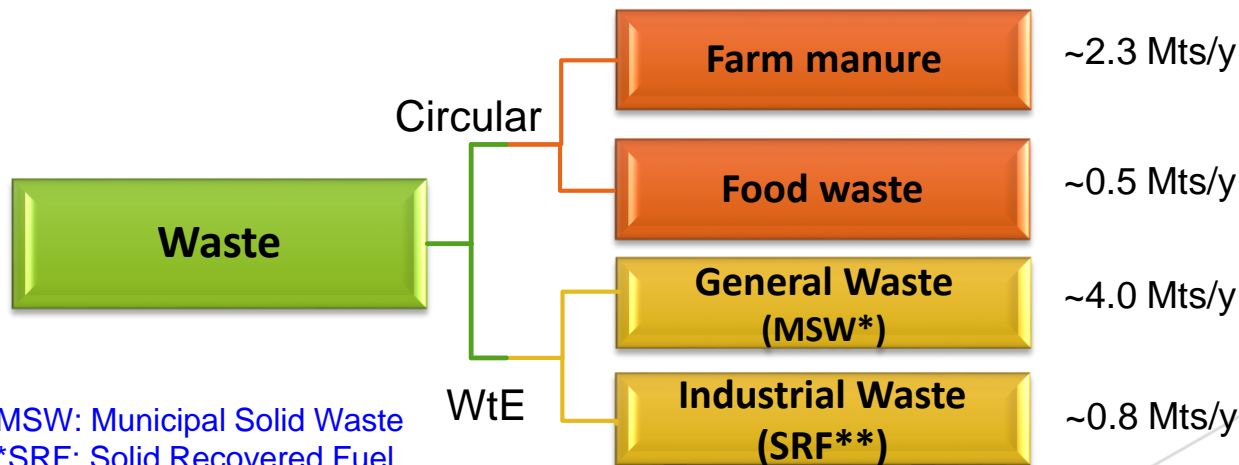
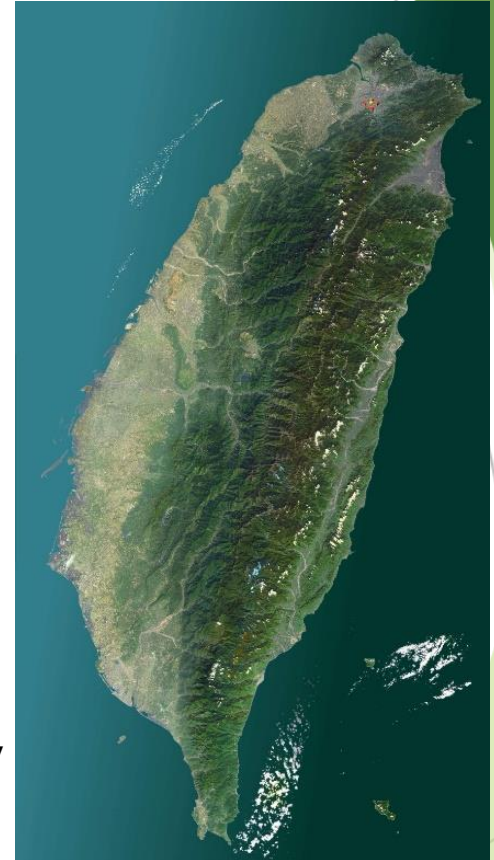
BCG in Chinese Taipei (1/3)

➤ Demographics

- Area: 36,000km²
- Population: 23 millions
- Population density: 640 people/km²
(urbanization:78%)

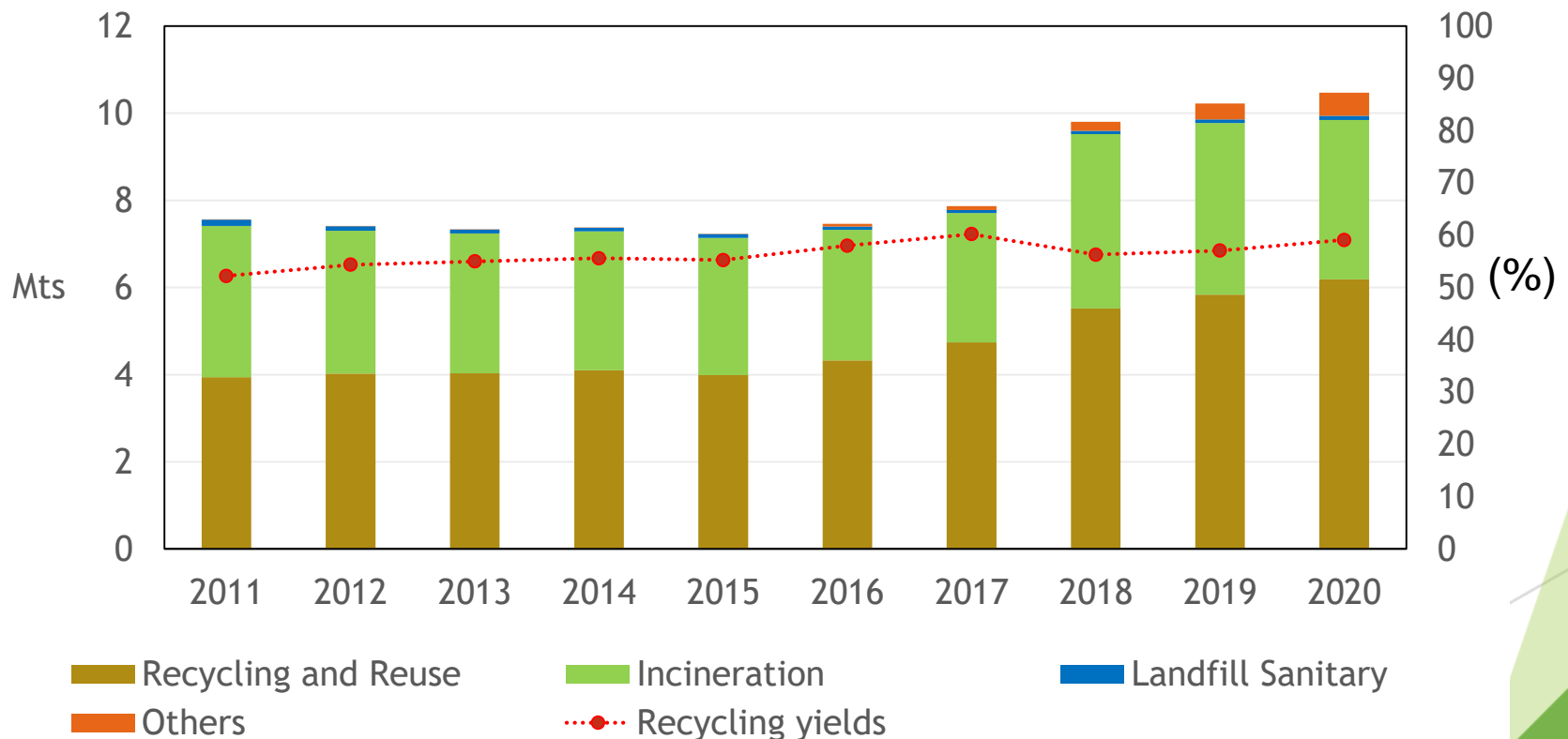
➤ The potential of biomass/waste circular and reuse

- Farm manure : ~2.3 Mts/y
- Food waste : ~0.5 Mts/y
- Industrial waste (SRF) : ~0.6 Mts/y



BCG in Chinese Taipei (2/3)

- One of the highest recycling rates in the world.
- Nearly 60% general waste disposal is recycled.
- 40% general waste goes to incinerators (632 MW, 3.6 TWh/y).



BCG in Chinese Taipei (3/3)

- Chinese Taipei relies on imports for **98.7%** of its energy.
- Bio-power target and planning

	2022.07	2025
Bio-power target	724 MW (1.2% of total electricity installed capacity)	778 MW
Resource	<ul style="list-style-type: none">• MSW / Industrial Waste• Biogas & Agricultural Waste	

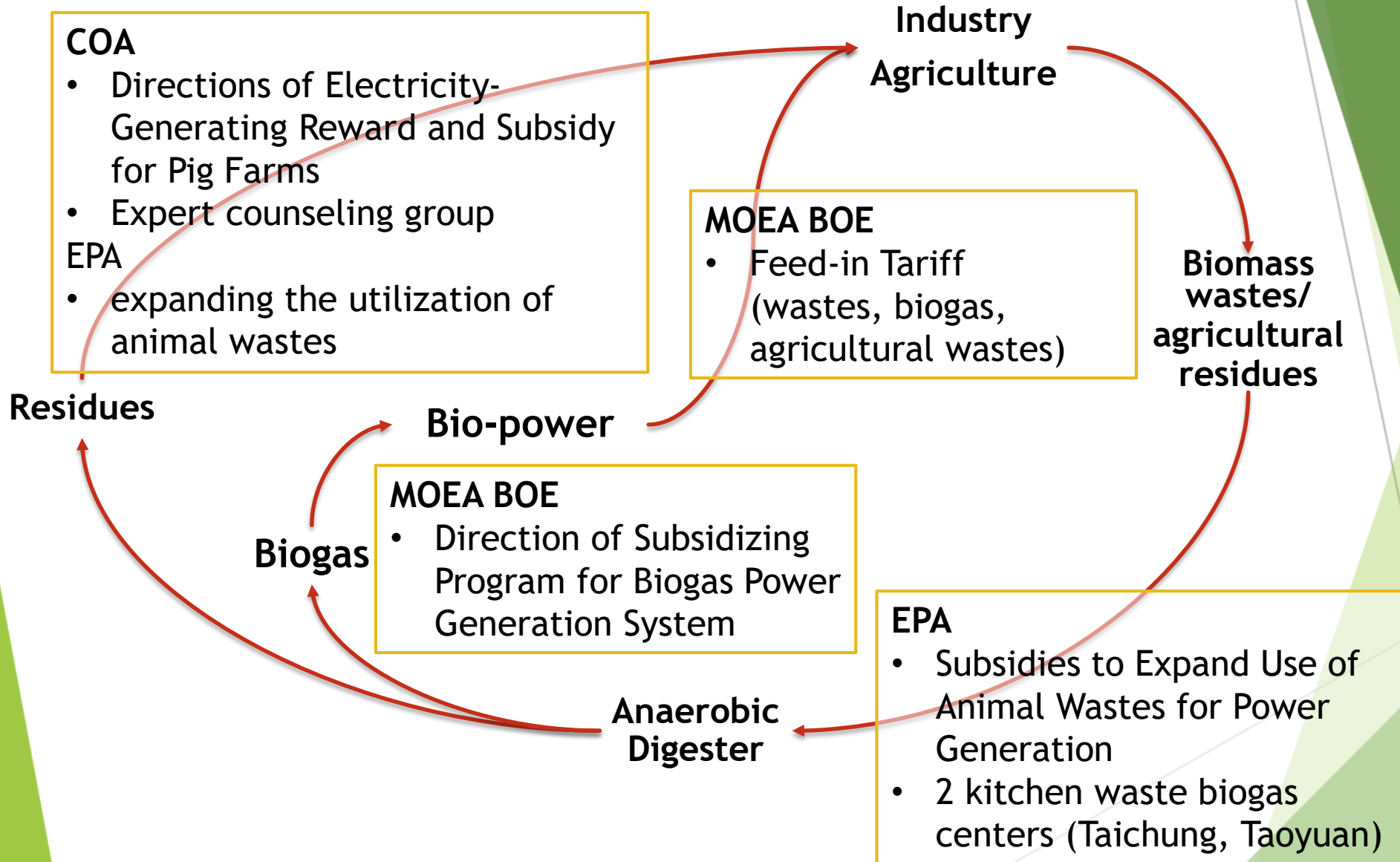
➤ Strategy

- **Subsidy policy** to accelerate the formation of BCG model
- **bio-fuels** from agro-forestry wastes.
- **biomass** energy in base-load power plant and co-generation system.
- **biogas** from wastewater and animal manure



Biogas power plant, Pig farm waste water, Yunlin county

BCG model in Chinese Taipei



RE Policies on BCG (1/3)

➤ Renewable Energy Development Act (by MOEA)

- In order to systematically promote renewable energy, in July of 2009, Chinese Taipei promulgated the **Renewable Energy Development Act**.
- **Feed-in Tariff (FIT)**
 - For SRF/RDF(Refuse-derived fuel) : 124.2USD/MWh (3.9482 NTD/kWh @2022)
 - For agricultural waste :161.7USD/MWh (5.1407NTD/kWh @2022)
 - For biomass energy (biogas) :163USD/MWh (5.1842NTD/kWh @2022)

➤ Biogas power promotion (by MOEA)

- MOEA announced the “**Direction of Subsidizing Program for Biogas Power Generation System**” on January 22, 2013

- Requirement:
Installed capacity per application: 30–500 kW
- Subsidiary items:
 - (1) 31,447 USD (1 million NTD) for dissemination
 - (2) Installation subsidies up to 1,415 USD (45,000 NTD) per kW
 - (3) 18,868 USD (600,000 NTD) for a 3-year demonstrative operation

1 USD = 31.80 NTD

Year	Location	Capacity
2013	Pintung	195 kW ¹
	Chunghua	195 kW ¹
2014	Pintung	65 kW ¹
2016	Chiayi	130 kW ¹
	Chiayi	225 kW ¹
	Tainan	260 kW ¹
2018	Pintung	325 kW ¹
2019	Yunlin	250 kW ¹
2020	Pintung	360 kW ²

Note1:Operating, Note2:Installing

RE Policies on BCG (2/3)

➤ Biogas power promotion (by COA)

- According to “**Comprehensive transformation and upgrading of pig industry**” provides reward and subsidies for pig farms.
- The COA guidance biogas slurry and residue removal (TaiSugar Donghaifeng Agricultural Circular Park produce **23,000 MWh** (power) and **2,000 ton fertilizer** per year).
- According to Agricultural Green Energy Loan Project provides policy-oriented special agricultural loan for green energy facilities.
- **Expert counseling group** was set up to visit livestock farms and solve relevant issues.

TaiSugar Donghaifeng



RE Policies on BCG (3/3)

➤ Biogas power promotion (by EPA)

■ Subsidies to **Expand Use of Animal Wastes for Power Generation**

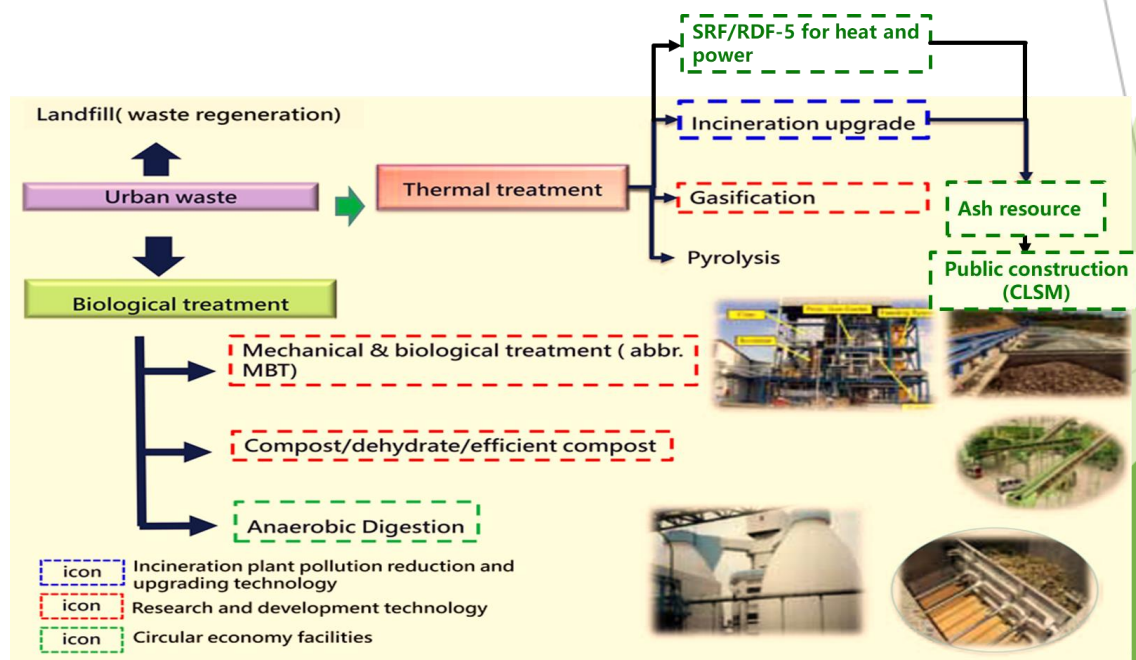
- Encourage large livestock operations to collect manure from small scale livestock operations
- 14 cases have been verified

➤ Diversified Waste Treatment Plan (by EPA)

■ EPA provides economic incentives for waste treatment diversification (circular)

- Incineration upgrade, SRF, anaerobic digestion, compost

■ 2 **kitchen waste recycling biogas centers** (Taichung, Taoyuan)



Concluding Remarks

- A transition from conventional energy systems to one based on renewable resources is on going.
- Chinese Taipei is trying and realizing BCG concept on recycling wastes from industry and agriculture to energy.
- Chinese Taipei's effective waste management policy provides a good foundation for developing BCG economy model.



Biogas from pulp mill wastewater (YUEN FOONG YU GROUP)



Biogas from pig manure (Hualien)

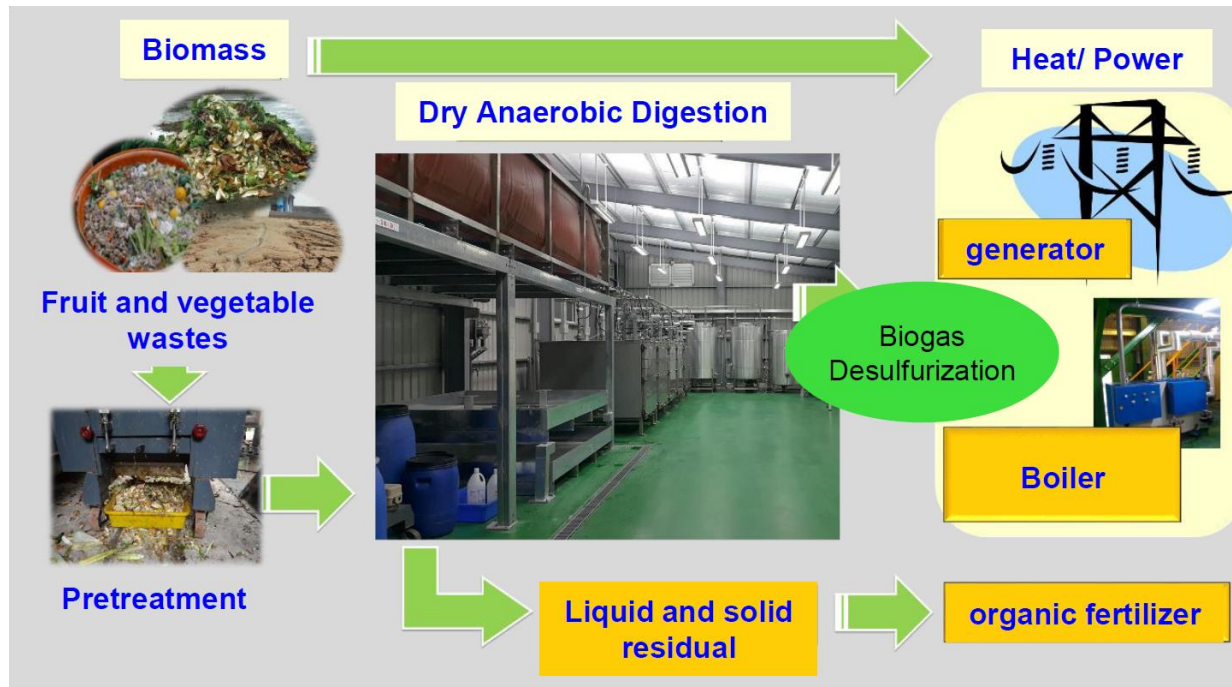
Thank you for your attention.



Potential of BCG in Chinese Taipei

➤ BCG economic model of biomass wastes dry anaerobic digestion

- A 100 T/D plant for fruit and vegetable waste :
 - 84,300 NTD/day for green power (16,700 kWh)
 - 125,000 NTD/day for organic fertilizer
 - PB(Payback) : 5~6 years



- Farm manure : ~2.3 Mts/y
- Food waste : ~0.5 Mts/y