



**Asia-Pacific
Economic Cooperation**

2022/CTI/SYM1/002

**An Overview of Bio-Circular-Green Economy Model
– Thailand’s Sustainable Growth Engine and the
National Development Agenda**

Submitted by: Thailand



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Bangkok, Thailand
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An Overview of BCG Economy Model

Thailand's Sustainable
Growth Engine and
National Development
Agenda

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CHALLENGES AND Opportunities for Thailand



CLIMATE
CHANGE



AGEING
SOCIETY



SOCIAL
DIVIDE



ECONOMIC
CRISIS



EPIDEMIC/
PANDEMIC



POLLUTION AND
ENVIRONMENTAL
DEGRADATION

STRENGTHS

WEAKNESSES

MEGA TRENDS

Food security (World kitchen)	Low export value of food and agricultural products	Demand for high quality and safe goods/services
Health security	Rely on imported medicine and medical supplies & equipment	Growing market of health products and services
Wealth of natural resources and culture	Quantity tourism, not quality tourism	Rise of sustainable development



THAILAND'S **BIO-CIRCULAR-GREEN** ECONOMY (BCG) MODEL



13 MECHANISMS TO DRIVE BCG POLICY

01	02	03	04	05
Create digital repository of bioresources, cultural capital and local wisdom	Replenish national resources	Develop BCG corridor	Transform agricultural system	Improve quality and safety of street food and local food
06	07	08	09	10
Build a biobased economy	Create demand for innovative goods and services derived from BCG model	Promote sustainable and green tourism	Promote the development and manufacturing of sustainable goods and services	Raise the standards of products and services
11	12	13		
Support BCG startups	Develop manpower to support BCG model	Promote international collaboration		

EXPECTED OUTCOME OF BCG MODEL IN 2027

Sustainability of resources and the environment



- 1/4 reduction in natural resource consumption
- 20% reduction of greenhouse gas emissions
- add at least 0.5 million ha of forest area

Socioeconomic prosperity



- improve income inequality of 10 million people
- reduce the proportion of undernourished population to 5%
- increase health inequality of at least 300,000 people
- increase the number of energy self-sufficient communities by 20%.

Sustainable economic growth



- economic value of the BCG industries up by 1 trillion THB
- 20% increase in the proportion of high-value products and services
- at least 50% more income to the grassroots

Self-reliance



- at least 1 million workers are retrained
- 1,000 new startups and IDEs
- improve negative technology balance of payment by at least 20%
- 20% reduction in medical and health supplies import

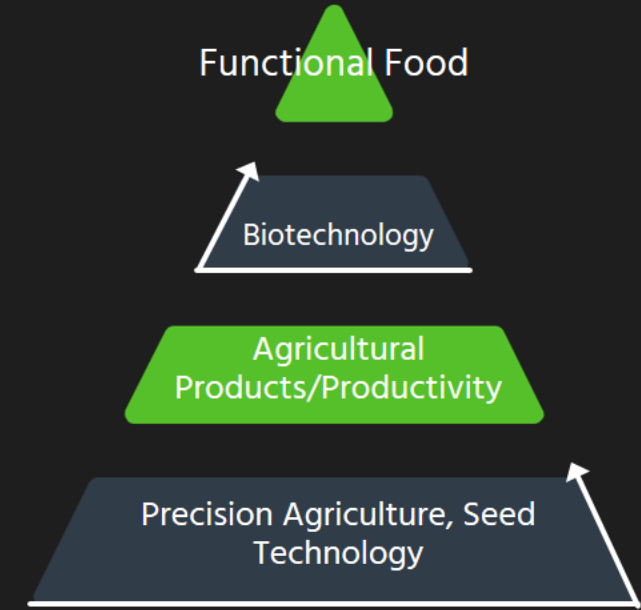
AGRICULTURE AND FOOD



GROWTH OPPORTUNITY

- Functional health food and beverage
- Quality and safety of local and street food upgrade
- Herbal extract & natural products
- Product diversification: herbal plants, fruits, seeds, ornamental plants, edible insects
- Premium farm products with technology and GAP

VALUE CREATION



AGRICULTURE

- Involves one-third of the total employment or 11 million people
- Contributes 9% to GDP or 44 billion USD
- 90% of cultivated land used for 6 crops: rice, rubber tree, cassava, sugarcane, corn, and oil palm tree

FOOD

- >13,000 food processing and beverage factories (Department of Industrial Works (DIW),2021), generating 100 billion USD, one-third of which are export income
- Contributes 5.8% to GDP
- Rank 13 largest food exporter in the world, and the 2nd in Asia
- Top export products: rice, canned and processed seafood, fresh and processed fruits, chicken meat and processed chicken and cassava products
- 100,000 operators of local food and street food
- Health food and beverage is a fast-growing sector, with 6 billion USD market value

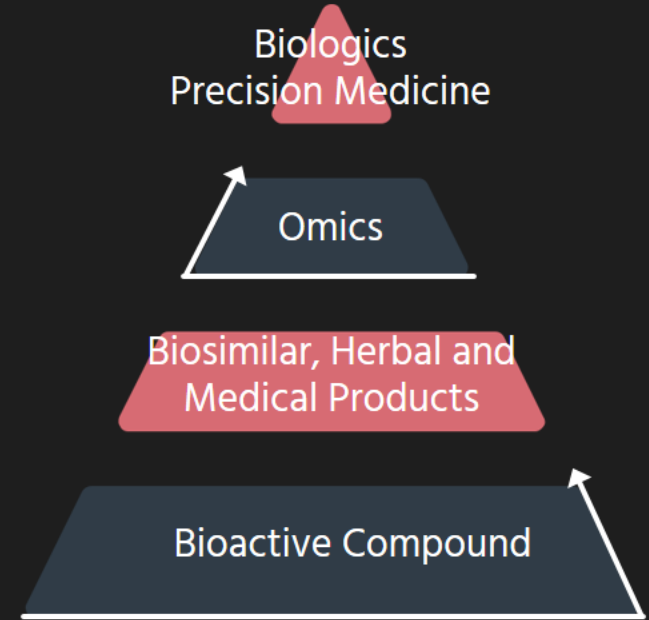
MEDICAL AND WELLNESS



GROWTH OPPORTUNITY

- Local manufacturing of API and biopharma
- Clinical research
- Medical and wellness tourism
- Medical devices
- Local herbal supply
- Improve technological capacity of cosmetic SMEs

VALUE CREATION



PHARMA

- 3.8 billion USD of imported drugs and pharmaceutical products
- 90% of locally-manufactured drugs are generic drugs, producing from imported API
- 148 GMP-certified pharmaceutical manufacturers, only one is capable of producing biosimilars

MEDICAL SERVICE

- 70% of foreign patients are medical tourists
- Ranks 5th in Medical tourism by Medical Tourism Association
- 8.8 billion THB (290 million USD) revenue earned from clinical research

MEDICAL DEVICES AND SUPPLIES

- Trade surplus with 100 billion THB (3 billion USD) export value against 70 billion THB (2.3 billion USD) import value 79 billion THB (2.5 billion USD)
- largest medical device market in ASEAN with an 8-10% annual growth (world's average is 5.2%)
- > 1,500 medical device manufacturers, mostly joint-venture SMEs with foreign partners
- 84% of export products are medical supplies (alcohol & mask), while import products are mostly medical equipment (ultrasound machines, x-ray machines)

COSMETIC

- 300 billion THB (10 billion USD) market size
- 1,800 cosmetic manufacturers, 90% are SMEs
- Low quality and quantity of local herbal supply

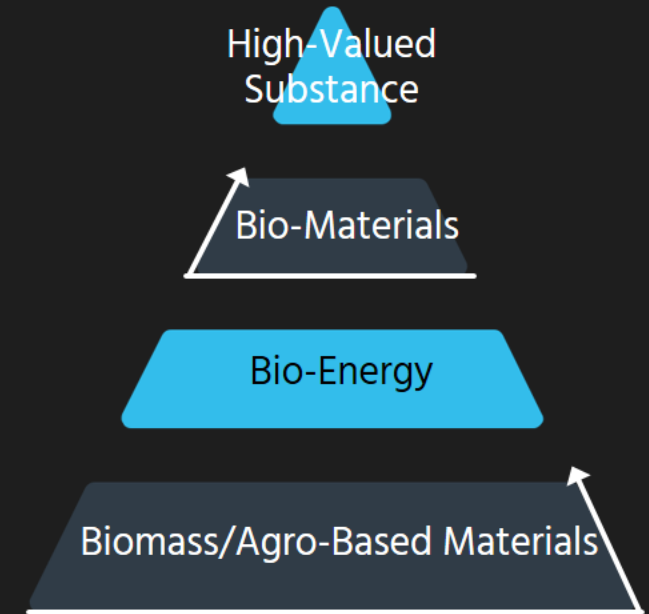
ENERGY, MATERIALS AND BIOCHEMICALS



GROWTH OPPORTUNITY

- Biomaterials and functional ingredients from biorefinery application
- High performance battery and energy storage
- Community-based power plant with advanced energy storage system and blockchain-based smart microgrid
- Renewable energy production: RDF (refuse-derived fuel) and biogas
- Petrochemical industry

VALUE CREATION



MATERIALS AND BIOCHEMICALS

- Worldwide market value expected to reach 487 billion USD by 2024
- Strategy to increase value of biomass and farm commodities by turning into functional ingredients, bioactive compounds and building blocks for chemicals and high value biochemicals
- 8.36 million tons of biomass or agro-waste from agriculture & food sector in Thailand could be turning into raw material of RDF

ENERGY

- 60% of total energy consumption are imported
- 16.5% of total energy consumption are from renewable source, 2030 target is 30%
- Enough biomass to meet 30% renewable energy target
- Increase the proportion of new electricity generation with renewable energy not less than 50%

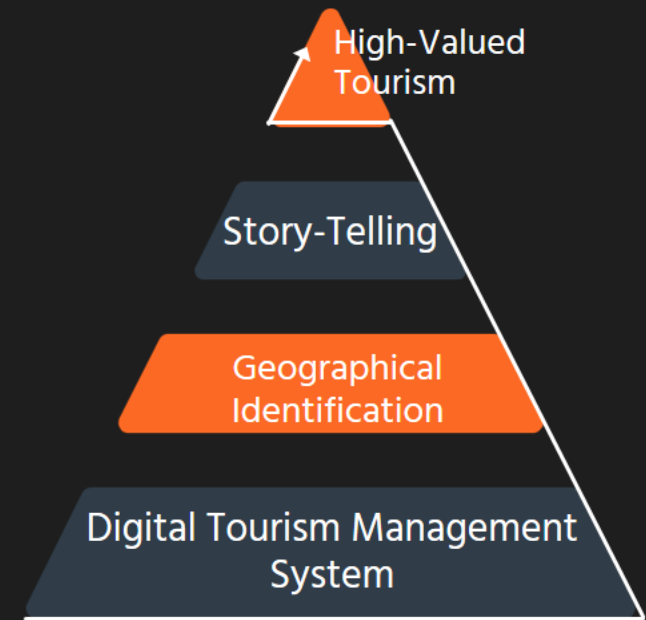
TOURISM AND CREATIVE ECONOMY



GROWTH OPPORTUNITY

- New types of tourism: agritourism, low-carbon tourism and knowledge tourism
- Sustainable goods and services with circular design and green technology
- Environmental rehabilitation, secondary-city destination, sustainable tourism
- Public payment gateway for tourism businesses

VALUE CREATION



TOURISM

- 0.4 trillion THB (12 billion USD) revenue, 6 percent from foreign tourist reduce from two-thirds before COVID pandemic
- 40 million foreign tourists, mostly low-income tourists
- 80% of the revenue are concentrated in only 8 provinces

CREATIVE ECONOMY

- Current value of Thailand's creative economy is 10-12 percent of GDP or 14-17 percent of national income
- The higher value comes from the functional creation group, cultural heritage group
- The design is the most valuable group and followed by handicraft and fashion group with combined value of 9.5 percent of GDP

EXAMPLES OF BCG-IN-ACTION



GLOBAL BUGS

Alternative Protein from Crickets

Under scale up process with a minimum of 160 tonnes of fresh crickets per annum, equal to minimum 40 tonnes of dry entopowder™.



MITR PHOL GROUP

Alternative Sugar from Sugarcane

Under scale up process of technologies that converse agricultural products into functional ingredients.



Alternative Protein from Fruit Fly

High quality protein powder with bio-available minerals and essential amino acid profile.



Food Bank for the Desperate and Vulnerable

Delivered over 8 million meals in 2021 to the desperate and vulnerable and reduced ~4,000 tons of Co2 emission from food waste.

EXAMPLES OF BCG-IN-ACTION



**COVID-19
Vaccine**



The sole Manufacturing site of
Oxford/AstraZeneca COVID-19
Vaccine in Southeast Asia



**Cell and Gene
Therapy**

Fully GMP-compliance CDMO providing manufacturing
services for Chimeric Antigen Receptor (CAR) modified
T-cells.



**Antiviral Drug for
COVID-19 Treatment**

Synthesizing the precursor of Favipiravir for
commercial production.



**COVID-19
Vaccine**

Quick, simple, and scalable biopharma platform
replacing biotech's conventional fermenter with plants.

EXAMPLES OF BCG-IN-ACTION

 STATUS



Scale up and Localization Services
for Function Ingredients and
Biochemicals

Officially launched on 29 March 2022



Polylactic Acid (PLA)

75,000 Tons of PLA/year



Polylactic Acid (PLA)

75,000 tons of PLA/year



Lactic Acid

100,000 Tons of Lactic Acid/year



Bio-epichlorohydrin
(glycerin)

100,000 Tons /year

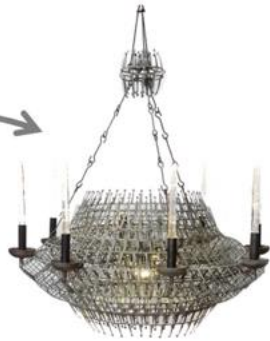
EXAMPLES OF BCG-IN-ACTION

PiN

THE REINCARNATION OF WASTE



Industrial waste



home decorative products



UPCYDE "Transformation"



Agricultural wastes



Bioleather
Veganleather

EXAMPLES OF **BCG-IN-ACTION**

Smart Farming – Durian Cultivation @ Bua Kaew Durian Orchard

- **Substantially reduce water consumption** and increase water-use efficiency without compromising on the quality of durians.
- **Reduce labor usage and increase quality of life of orchard owner**

with “Smart Plant Watering Control and Weather Monitoring System” supported by Agricultural Technology and Innovation Management Institute (AGRITEC).

1000

LITERS/TREE/DAY



90

LITERS/TREE/DAY
*initial figure



EECi: 'THE BCG INNOPOLIS'

An ecosystem to translate research and innovation into sustainable regional economic development and societal well-being.



Service Infrastructures @ EECi



Biorefinery Pilot Plants



Sustainable Manufacturing Center: SMC

Greenhouse & Plant Factory



Zn-Ion Battery Pilot Plant

Smart Farming and Demo Sites



CAV Proving Ground

Modern Aquaculture Facility



UAV Sandbox



3-GeV Synchrotron Facility

Agriculture & Food

Health & Wellness

Energy, Materials & Biochemicals

Digital & Electronics

Grand Opening in November 2022

EECi Biorefinery Pilot Plants

Agricultural
Produces

Agro-Wastes



- Multi-purposed, Generic and Open Platform for Technology Scale Up and Localization
- Technology Scaling up and Technology Localization
- Managed by **Bio Base Asia Pilot Plant**, a joint venture between NSTDA and Bio Base Europe Pilot Plant, to provide technical services to industry & academia.

Food
Supplements
& Nutra-
ceuticals

- Functional Ingredients
- Flavor Enhancers
- Super Antioxidants
- Alternative Proteins
- Specialty Carbohydrates
- High Value Fatty Acids

Cosme-
ceuticals

- Bioactive Compounds

Bio-
chemicals
&
Bio-based
Materials

- Bio-Plastics
- Bio-Surfactants
- Bio-Controls
- Industrial Enzymes



BBAPP Inauguration
on 29 March 2022

Bio Base Asia
Pilot Plant

A background image showing several hands of different skin tones reaching towards the center to assemble white puzzle pieces. The puzzle pieces are arranged in a circular pattern, symbolizing teamwork and partnership. A semi-transparent white box is overlaid on the center of the image, containing the text 'OPPORTUNITIES FOR PARTNERSHIP' in red and white.

OPPORTUNITIES FOR PARTNERSHIP

- **Development of High-Value Products from Local Biological Resources**
- **Localization of Advanced Technologies for Thailand and ASEAN Market**
- **Joint Research between International Firms & Research Institutes with Local Counterparts**
- **Shared use of Advanced Translational Infrastructures**
- **Joint Development of Talents**
- **Other Win-Win Partnering Arrangements !!!**

Thank you!

Contact us if there are any questions.

Website



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