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APEC CASE STUDY: TECHNOLOGY EMPOWERING BCG ECONOMY MODEL

Best Practice Study Report

APEC Policy Partnership on Science, Technology and Innovation

November 2023



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List of Acronyms

3R	Reduce, Replace, Remove
5GDP	5G Demonstration Project
A*STAR	Agency for Science, Technology and Research
ADB	Asian Development Bank
AI	Artificial Intelligence
APEC	Asia-Pacific Economic Cooperation
AR	Augmented Reality
ARTC	Advanced Remanufacturing and Technology Centre
ASEAN	Association of Southeast Asian Nations
BCG	Bio-Circular-Green
CCICED	China Council for International Cooperation on Environment and Development
CCSR	Clean Coal Special Re-lending
CERF	Carbon Emission Reduction Facility
CNIS	China National Institute of Standardization
CO2	Carbon Dioxide
COVID	Coronavirus
ESG	Environmental, Social, and Governance
et al.	et alia = and others
EVs	Electric Vehicles
EY	Ernst & Young
IEA	International Energy Agency

LO	International Labour Organization
IoT	Internet of Things
Ltd.	Limited
MCMC	Malaysia Communications and Multimedia Commission
MSMEs	Micro, Small and Medium-sized Enterprises
NSTDA	National Science and Technology Development Agency
NTU	Nanyang Technological University
OECD	Organisation for Economic Co-operation and Development
PPP	Public-Private Partnership
PV	Photovoltaic
R&D	Research and Development
SDG	Sustainable Development Goal
SOM	Senior Officials' Meeting
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNSDGs	United Nations Sustainable Development Goals
VR	Virtual Reality
WWF	World Wide Fund

Glossary

3D	Three-dimensional/three dimensions: in computers, 3D describes an image that provides the perception of depth.
5G	5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks.
Artificial Intelligence (AI)	AI is a particular computer system or machine that has some of the qualities that the human brain has, such as the ability to interpret and produce language in a way that seems human, recognize or create images, solve problems, and learn from data supplied to it.
Augmented Reality (AR)	AR is the real-time use of information in the form of text, graphics, audio and other virtual enhancements integrated with real-world objects.
BCG Economy Model	The Bio-Circular-Green Economy Model is a holistic framework that emphasizes the interdependence of business, society, and the environment. It highlights the significance of the model in guiding sustainable economic development across different sectors.
Big Data	Big data refers to the large, diverse sets of information that grow at ever-increasing rates.
Bio-Economy	The Bio-Economy encompasses economic activities related to biotechnology and biomass.
Blockchain	Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network.
Carbon Capture and Storage (CCS)	The CCS refers to a collection of technologies that can combat climate change by reducing carbon dioxide emissions.
Circular Economy	The Circular Economy is a regenerative production-consumption system that minimizes resource inputs, waste, and emissions through material circulation and regenerative and restorative design of products, services, and systems.
Cloud	The cloud is a distributed collection of servers that host software and infrastructure, and it is accessed over the Internet.

Data Analytics	Data analytics is the collection, transformation, and organization of data in order to draw conclusions, make predictions, and drive informed decision making.
Electric Vehicle (EV)	The EV is a vehicle that uses one or more electric motors for propulsion.
Green Economy	The Green Economy utilizes ecosystem processes to improve human wellbeing and social equity without compromising ecological sustainability.
Hydroponics	Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite.
Internet of Things (IoT)	IoT refers to objects with computing devices in them that are able to connect to each other and exchange data using the internet.
Machine Learning	Machine learning is a branch of AI and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.
Nanotechnology	Nanotechnology refers to the branch of science and engineering devoted to designing, producing, and using structures, devices, and systems by manipulating atoms and molecules at nanoscale.
Quantum Technology	Quantum technology is a class of technology that works by using the principles of quantum mechanics.
Renewable energy	Renewable energy is energy derived from natural sources that are replenished at a higher rate than they are consumed.
Sustainable Development Goals (SDGs)	The SDGs were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.
Thailand 4.0	Thailand 4.0 represents a combination of promoting industrial transformation and establishing an economic corridor in eastern Thailand.

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EXECUTIVE SUMMARY

The APEC Case Study: Technology Empowering BCG Economy Model report presents a comprehensive analysis of best practices from various member economies within the Asia-Pacific Economic Cooperation (APEC) region. It focuses on identifying and showcasing exemplary cases that demonstrate the successful integration of advanced technologies to empower the Bio-Circular-Green (BCG) Economy Model. These best practices exemplify how innovative technologies can contribute to economic growth, environmental sustainability, and social inclusivity.

The report begins by introducing the BCG Economy Model, a holistic framework that emphasizes the interdependence of business, society, and the environment. It highlights the significance of the model in guiding sustainable economic development across different sectors.

Through a systematic methodology that includes literature review, surveys, expert interviews, and case studies, the report delves into the findings and key insights from these best practices. The methodology ensures a comprehensive and rigorous examination of the technologies and strategies employed in promoting the BCG Economy Model.

The best practices identified span various sectors, including agriculture and food, environment and energy, biotechnology, supply chain, technology, tourism, among others. Each case study provides a portrait of the initiatives, their compliance with the BCG Economy Model, and the economic, environmental, and societal benefits they generate.

The economic benefits of the best practices are evident through increased efficiency, enhanced productivity, and new business opportunities. The environmental benefits are realized through reduced carbon emissions, resource conservation, and sustainable practices. Additionally, these initiatives contribute to societal benefits by fostering inclusiveness, empowering vulnerable groups, and promoting social responsibility. The report also emphasizes the transferability and replicability of the best practices across different APEC economies.

By examining the key factors that contributed to the success of each case, the report offers recommendations to further empower the BCG Economy Model. These recommendations encompass policy measures, technology advancements, capacity-building initiatives, and collaborative efforts among APEC member economies. By implementing these recommendations, the APEC region can foster sustainable and inclusive economic growth, promote technological innovation, and address environmental challenges.



1

INTRODUCTION

The APEC region is characterized by its diverse economies and industries, encompassing sectors such as agriculture and food, environment and energy, biotechnology, supply chain, technology, tourism, and many others. As the region continues to strive for sustainable and inclusive economic development, the BCG Economy Model has emerged as a valuable framework for guiding and promoting practices that balance economic growth, environmental sustainability, and social well-being.

The BCG Economy Model, initiated by the Thailand government, presents a holistic approach to economic development that emphasizes the interdependence of business, society, and the environment. It seeks to foster sustainable practices and innovation across different sectors, promoting the efficient use of resources, reducing environmental impact, and enhancing social inclusivity.



Within the APEC region, numerous exemplary cases have emerged, showcasing best technology practices that empower the BCG Economy Model. These cases demonstrate how innovative technologies and forward-thinking approaches can contribute to sustainable economic growth while addressing environmental challenges and social inequalities.

This research report aims to establish a systematic literature review that explores the definition of the BCG Economy Model and identifies lessons learned and best technology practices to achieve the model. It is part of the APEC Bio-Circular-Green (BCG) Startups Regional Program on Sustainable Growth, promoting the BCG Economy Model and advancing sustainable development within the APEC region.

The specific research objectives of this report are as follows:

· *To discuss and enhance the definition of the BCG Economy Model based on lessons learned and reports from relevant stakeholders.*

· *To identify technologies and best practices, such as AI, machine learning, and others, that contribute to the BCG Economy Model.*

· *To develop policy recommendations for promoting technology for the BCG Economy Model.*

· *To strengthen the capacity of APEC economies in harnessing technology for the empowerment of the BCG Economy Model.*

The main objective of this study is to identify best technology practices that enhance the BCG Economy Model. Therefore, the report focuses on answering the following research questions:

·*What is the definition and goal of the Model? What is the current policy progress of it?*

· *Which industries have successfully applied the BCG Model?*

· *What are the best technology practices to implement the BCG Economy Model?*

· *What key factors of the best practices have contributed to the success of the Model?*

Through a comprehensive evaluation of selected cases, this research report will delve into the details of each case from startups and other businesses, presenting a portrait of the initiatives and their compliance with the BCG Economy Model. It will explore the foundation and organizational structure of the companies, their geographical scope, and the activities they undertake in alignment with the BCG Economy Model. Additionally, the economic, environmental, and societal benefits of each case will be examined, along with their inclusiveness, adaptability, and potential for transferability to other economies.

By presenting these best technology practices, this research report aims to inspire and encourage the adoption of sustainable and innovative approaches across different sectors and member economies. The examples will serve as models and sources of inspiration for policymakers, businesses, and stakeholders seeking to integrate technology and sustainable practices into their strategies and operations. Further, the authors hope to contribute to the knowledge exchange and collaboration within APEC, fostering a collective effort to build a more sustainable, inclusive, and resilient future for the region.



2

METHODOLOGY

The research employed a multi-faceted approach to explore and identify the best technology practices that promote the BCG Economy Model. The methodology consisted of four key research methods: literature review, surveys, expert interviews, and case studies.

2.1 Literature Review

The research began with a comprehensive literature review of existing research, academic literature, policy progress on the BCG Economy Model, and technology applications related to the model. It aimed to understand the evolution of the model, its various applications across industries, and the existing knowledge of case studies and best practices. The review followed the six stages outlined by Xiao and Watson (2019): formulation of research questions, search criteria and identification, screening process, title and abstract screening, quality assessment, and data extraction. The literature review focused on addressing the following research questions:

· *What is the definition and goal of the Model? What is the current policy progress of it?*

· *Which industries have successfully applied the BCG Model?*

· *What are the best technology practices to implement the BCG Economy Model?*

· *What key factors of the best practices have contributed to the success of the Model?*

The selection of research articles involved using specific search queries and keywords related to the research questions. Identified articles were then screened based on their relevance to the inclusion and exclusion criteria through title and abstract screening.

2.2 Surveys

To gather insights on the implementation of the BCG Economy Model, a survey consisted of nineteen questions was conducted in APEC economies. It aimed to capture the perspectives and experiences

A diverse sample of individuals was selected to ensure representation from different economies and sectors. Participants were recruited through targeted outreach and networking within the APEC community. The sample included individuals from eleven APEC economies and one non-APEC economy, including Cambodia; Canada; Chile; People's Republic of China; Hong Kong, China; Indonesia; Malaysia; Mexico; the Philippines; Thailand; the United States; and Viet Nam.

The data collected was analyzed using both quantitative and qualitative methods. Quantitative analysis involved tabulating the response frequencies to identify trends and patterns, while qualitative analysis focused on extracting key themes and insights from the open-ended responses.

It is important to acknowledge certain limitations of the survey. The sample may not represent all APEC economies comprehensively, and the findings may be influenced by the self-reported perspectives of the participants. Additionally, the survey results are subject to the inherent biases and limitations associated with self-reporting data.

2.3 Expert Interviews

In-depth interviews were conducted with individuals from seven APEC economies who have extensive experience in designing or applying the BCG Economy Model. The interviews were conducted with a total of nine experts from various backgrounds, including government agencies, academia, industry practitioners, and consultants. The selection of experts was based on their expertise and experience in promoting technology empowerment for the BCG Economy Model.

The interviews involved twenty-two questions, building upon the nineteen questions used in the survey.

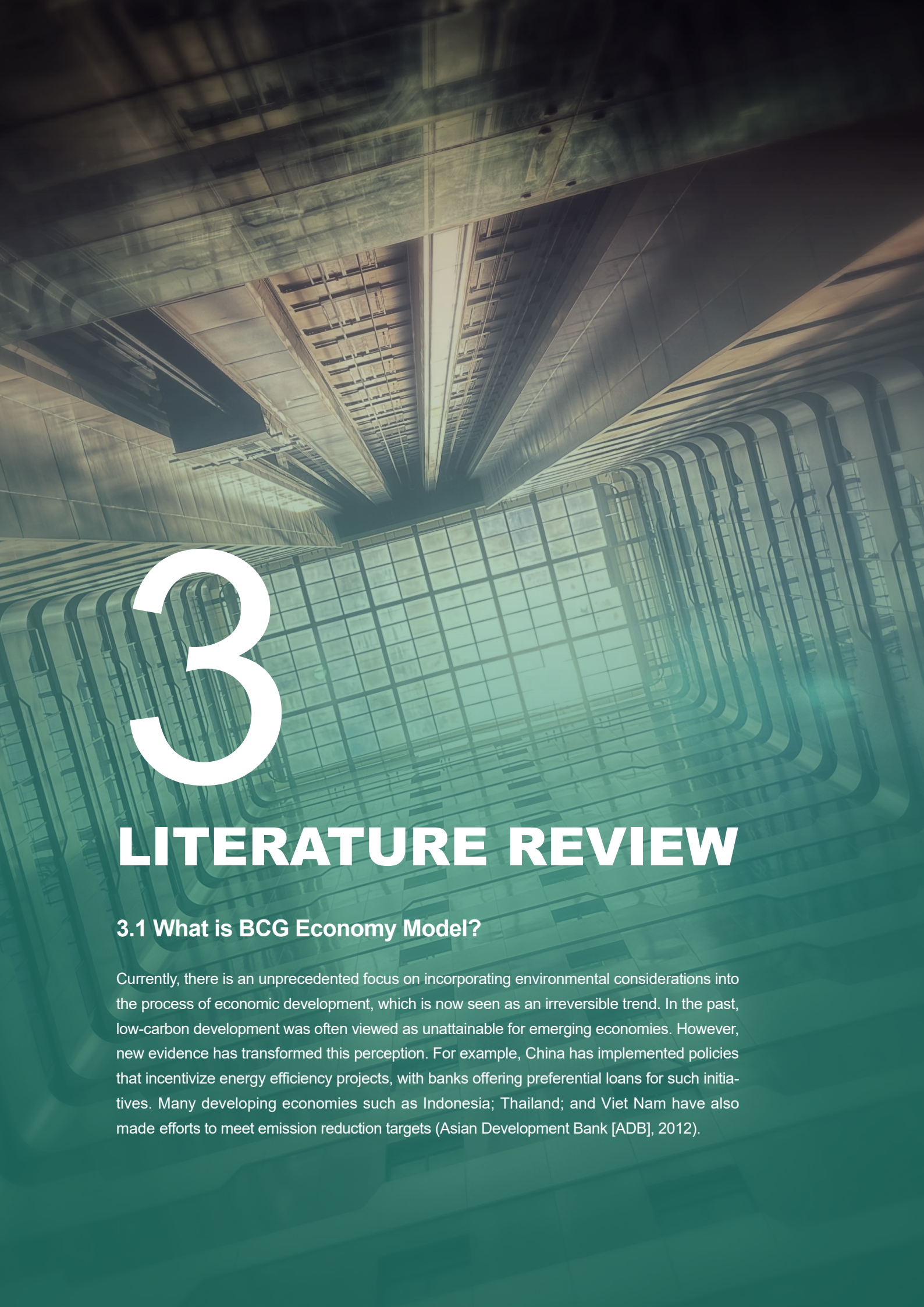
The interviews explored open-ended questions to gather in-depth information on the key challenges and opportunities in implementing the model, as well as the strategies and technologies used to promote it.

2.4 Case Studies

The research included case studies of startups and other businesses that have successfully applied technology to achieve the BCG Economy Model. These case studies provided valuable insights into the implementation of the model, including both startups, large multinational corporations, and micro, small, and medium enterprises (MSMEs).

The case studies aimed to identify the key technologies and factors that contributed to the success of the BCG Economy Model in each organization. Additionally, they aimed to provide strategic recommendations and approaches that shape the future of the model.

The selection and analysis of best practice cases followed a stepwise approach, including defining and categorizing the case studies, and creating a best practice portfolio. A draft checklist was developed to evaluate the selected cases based on their compliance with the BCG Economy Model, technical innovativeness, effectiveness, sustainability, replicability, inclusiveness, and adaptability.



3 LITERATURE REVIEW

3.1 What is BCG Economy Model?

Currently, there is an unprecedented focus on incorporating environmental considerations into the process of economic development, which is now seen as an irreversible trend. In the past, low-carbon development was often viewed as unattainable for emerging economies. However, new evidence has transformed this perception. For example, China has implemented policies that incentivize energy efficiency projects, with banks offering preferential loans for such initiatives. Many developing economies such as Indonesia; Thailand; and Viet Nam have also made efforts to meet emission reduction targets (Asian Development Bank [ADB], 2012).

In line with the goals of sustainable development and post-pandemic recovery, the Thailand government has proposed the Bio-Circular-Green (BCG) Economy Model as a strategy. This model places emphasis on applying technology and innovation to drive development in Thailand' s four strategic sectors: agriculture and food, wellness and medical, bioenergy and biochemicals, and tourism and creative economy (National Science and Technology Development Agency [NSTDA], 2021a). It aims to promote the sustainability of biological resources, strengthen communities and grassroots economies, and enhance the resilience and competitiveness of BCG industries in Thailand.

This initiative holds great potential for application in other APEC economies and industries, leading to its inclusion in the APEC agenda in 2022. Aligning with the APEC Putrajaya Vision 2040 (Andres et al., 2022), the model provides a common framework for considering sustainability-related policy responses.

The framework has developed policies that not only ensure continuous economic growth and prosperity, but also maintain, improve, and protect ecosystems. This framework also enables the introduction of inclusive approaches to empower vulnerable groups, MSMEs, and startups (APEC, 2022a). In this broader context, the model emphasizes the need for a balanced, resilient, and sustainable economy that fosters equality and social justice, rather than solely focusing on economic growth (Elgenraam, 2022).

The BCG concept revolves around a diverse and dynamic definition. Research on the BCG model often calls for more comprehensive and holistic approaches (D'Amato & Korhonen, 2021; Geissdoerfer et al., 2017). Academia has been striving for a more structural definition. In this report, we adopt widely acknowledged concepts as follows:

- The Bio-Economy encompasses economic activities related to biotechnology and biomass (Kumagai, 2022; OECD, 2016). It involves the production of bio-based materials and renewable biological resources, as well as the conversion of these resources into value-added products such as bioenergy, bio-based products, feed, and food (Elgenraam, 2022; European Commission, 2017).

- The Circular Economy is a regenerative production-consumption system (European Parliament, 2023) that minimizes resource inputs, waste, and emissions through material circulation and regenerative and restorative design of products, services, and systems (Geissdoerfer et al., 2020). Simultaneously, this approach fosters ecosystem regeneration by reducing residual flows (Elgenraam, 2022; Ellen MacArthur Foundation, n.d.; Ekins et al., 2019).

- The Green Economy utilizes ecosystem processes to improve human wellbeing and social equity without compromising ecological sustainability. It contributes to significant reductions in environmental risks and ecological scarcities (Elgenraam, 2022; Kahle & Gurel-Atay, 2015; UNEP, 2018).

While the definitions and focuses of the Bio-Economy, Circular Economy, and Green Economy are not necessarily interdependent, their common objective is environmental conservation, and many aspects overlap (Kumagai, 2022). Therefore, the Thailand government has strived to integrate the model into a cohesive unit. Alternatively, instead of treating them as isolated tasks, it is essential to promote them as a more integrated whole, as these three economy models encompass all policy responses across complex economic, societal, and environmental relationships (Elgenraam, 2022).

3.2 BCG Policy Progress

Latest progress in Thailand

The BCG Economy Model emerged as an extension of Thailand 4.0, an economic model introduced in February 2017. In January 2021, the Thailand government announced the BCG Economy Model as a component of its agenda (Royal Thai Government, 2021). What' s more, during the APEC Summit in November 2022, the BCG Economy became the APEC' s sustainability development agenda, that APEC Leaders agreed upon the Bangkok Goals for the Economy. To realize the BCG economy, the Thailand government established the BCG Policy Board of Directors and the BCG Model Implementation Committee to drive policies, design action plans, and promote integration among organizations to move in the same direction (Loe, 2023; NSTDA, 2022a; Royal Thai Government, 2021). Thus, the model gained cooperations from various government bodies, including the Board of Investment of Thailand, the Ministry of Agriculture and Cooperatives, the Ministry of Energy, the Ministry of Industry, the Ministry of Natural Resources and Environment, and the Ministry of Tourism and Sports.

To support the model, the Thailand government shifted its' approach from public-led investment to enterprise-led investment, from cash-aid policy to investment policy (NSTDA, 2022a). It launched an 8-year incentive scheme on cooperate income tax and exemption of import duties as shown in Table 1 (Kaewsang, 2020). Recently, it introduced new incentives aimed at supporting high-tech industries, tax exemptions for companies relocating to Thailand, and rewarding existing investors for a wide range of BCG industries with nine measures for five key sectors, including the BCG sector, the EV supply chain, electronics manufacturing, the digital economy,and creative industries, from 3 January 2023 (ASEAN Briefing, 2022). The latest special incentives were eligible for ten new business sectors, such as hydrogen vehicles, electric vehicle battery swapping stations, organic food, and renewable energy. What' s more, investments in innovative and high-tech industries, such as biotechnology, nanotechnology, and advanced materials, can be eligible for 10 to 13 years of corporate income exemption without a cap (ASEAN Briefing, 2022).

	Category	Incentive	Exemption CIT	Exemption Import duties on machinery	Exemption Import duties on raw materials	Non-tax incentives
8Year	A1	Knowledge-based activities focusing on R&D and design to enhance the economy's competitiveness	8 years (no cap) + Merit years	✓	✓	✓
CIT Exemption	A2	Infrastructure activities for the economy's development, activities using technology to create value-added, with no or very existing investments in Thailand	8 years + Merit	✓	✓	✓
	A3	High technology activities which are important to the development of the economy, with a few investments already existing in Thailand	5 years + Merit	✓	✓	✓
	A4	Activities with lower technology than A1-A3 but which add value to domestic resources and strengthen the supply chain	3 years + Merit	✓	✓	✓
	B1	Supporting industry that does not use high technology, but is still important to the value chain	- years + Merit	✓	✓	✓
0 Year	B2	Supporting industry that does not use high technology, but is still important to the value chain	Year	✓	✓	✓

Table 1 Thailand Board of Investment support for investment in Thailand (Kaewsang, 2020)

Furthermore, the BCG Policy Board regularly reviewed policies and approved multiple initiatives for the BCG industries. These included the latest ones announced in October 2022, establishing the Center for Pharmacogenomics and Cancer Precision Medicine and the Center for Pharmacogenomics and Precision Medicine in Rare Diseases with the government budget of THB662 million (USD20 million) to benefit 4 million local people, setting up Thailand' s first active pharmaceutical ingredients manufacturing facility with THB1 billion (USD280 million), upgrading vaccine production infrastructure to manage infectious diseases in farm animals, and easing tax barriers for BCG projects (NSTDA, 2022b).

By promoting the model, the Thailand government estimated that sectors such as electric vehicles, smart electronics, and technologies could attract approximately THB2 trillion (USD57 billion) in investments from foreign and local companies by 2030. And such new investments had the potential to create 625,000 new jobs and contribute THB1.7 trillion (USD49 billion) to the economy's gross domestic product (Sangwongwanich, 2023).

Snapshots among some APEC economies

Chile: Chile had made notable progress in integrating the principles of the BCG related economy models into its policy framework. The government implemented regulations to promote circular and sustainable practices. Chile also focused on fostering innovation and entrepreneurship on relevant industries, such as circular manufacturing, clean technologies, and sustainable agriculture.

Particularly, Chile was at the forefront for its environmental policies. In June 2022, the government published the Framework Law on Climate Change, identifying the action plans and competences of different state organizations (Official Gazette of the Republic of Chile, 2022). The economy aimed to convert 70% of its overall energy consumption to renewable sources by 2030 and pledged to become carbon neutral by 2050. Hydrogen, as the core of its energy transition, was placed a strong emphasis.

The government committed USD50 million to six initiatives to advance the green hydrogen industry. In April 2022, the Chilean development office announced new funding agreements to support-green hydrogen activities (World Economic Forum, 2023). Another important sector was the circular economy, the government announced the Roadmap for a Circular Chile by 2040, aiming to promote a regenerative circular economy (Chile, Ministry of the Environment, 2021).

China: China recognized the importance of transitioning to a more sustainable and resource-efficient economy, and prioritized its policy agenda onmodels to support BCG Economy. The government implemented comprehensive measures to promote bio-economy, circular economy practices, and green practices, including regulations on bio technology development, recycling, waste management, and the development of renewable energy sources.

On its' top policy, the 14th Five Year Plan (2021-2025) outlined detailed policies to support bio, circular, and green economy, including promoting scientific projects in life and health, biological breeding, and medicine, implementing the circular economy and building a system for efficient resource recycling, and developing green economy through infrastructure upgrade and clean energy adoption, particularly with the technology and innovation

(State Council of the People's Republic of China, 2021). What' s more, in 2020, China announced to commit to hit peak emissions by 2030 and carbon neutrality by 2060. Programs such as the Carbon Emission Reduction Facility (CERF) and the Clean Coal Special Re-lending (CCSR) offered discounted lending to incentivize investments in green industries, including renewables, environmental protection, energy conservation, low-carbon technologies, and clean coal. China also made significant investments in technology development, particularly in areas such as AI, big data analytics, and clean technologies.

Japan: Japan demonstrated a strong commitment to the BCG Economy Model and implemented policies to promote sustainable practices across various sectors. The government encouraged the adoption of advanced technologies, such as IoT, robotics, and automation, to optimize resource utilization and reduce waste. Japan also focused on promoting circular supply chains and eco-friendly manufacturing processes. The economy's initiatives in sustainable agriculture, renewable energy, andwaste management positioned it as a leader in the implementation of the BCG Economy Model.

On 10 February 2023, Japan's cabinet approved the Basic Policy for the Realization of GX, setting strategies to achieve net-zero emissions by 2050. This policy included the promotion of thorough energy efficiency improvement, the use of renewable power as the main power source, and the utilization of nuclear power.

Singapore: Singapore was at the forefront of promoting the BCG Economy Model and implemented robust policies to drive its adoption. The government prioritized sustainable development and resource efficiency, with initiatives that encourage waste reduction, recycling, and the adoption of renewable energy sources. The economy also invested heavily in research and development, particularly in areas such as smart infrastructure, advanced materials, and sustainable urban planning.

The government launched the Singapore Green Plan 2030 in 2021, aiming to galvanize a movement and advance Singapore' s agenda on sustainable development (Singapore Government, 2021a). To promote green economy, the government rolled out special incentives, such as the Resource Efficiency Grant for Energy and the Energy Efficiency Fund, to reduce emissions and enhance technology adoption. It also launched the Research, Innovation, and Enterprise initiative and the Enterprise Sustainability Programme to support businesses on sustainability initiatives and innovative solutions (Singapore Government, 2021b).In a recent Minister for Sustainability and the Environment, the urgent need for a sustainable development was emphasized (Ministry of Sustainability and theEnvironment, Singapore, 2023). Meanwhile, Singapore adopted the 3R (Reduce, Replace, Remove) strategy, including improving the efficiency of energy-intensive processes, adopting renewable energy sources, and exploring innovative technologies such as novel electrolysis to capture carbon dioxide from seawater.

The United States: The United States made significant progress in advancing the BCG related economy through various policy initiatives. The government implemented comprehensive regulations to promote circular economy practices, including waste reduction, recycling, and sustainable resource management (U.S. Environmental

Protection Agency, 2023). Additionally, it focused on supporting innovation and research in areas such as clean energy technologies, sustainable agriculture, and advanced manufacturing, optimizing resource utilization and enhancing the efficiency of economic activities.

For example, the government's environmental vision focused on advancing clean energy, investing in climate science, strengthening resilience, promoting environmental justice, and asserting its global climate leadership. The Inflation Reduction Act aimed to accelerate the transition to clean energy and provide families with more affordable access to clean and energy-efficient technologies. Various initiatives were launched to drive the future of clean energy, promote environmental justice, and support a clean transportation future made in America (White House, 2023). In the context of the bio-economy, the government showed a strong commitment to promoting biotechnological innovations, sustainable agriculture, and bio-based industries with a whole-of-government approach (White House, 2022). The Department of Agriculture and other federal agencies supported research, development, and deployment of bio-based products and biofuels.

3.3 Technology Empowering BCG Economy Model

The BCG Economy Model highly emphasized applying science, technology, and innovation to drive economic growth (NSTDA, 2021a) and researchers believed that technology and innovation was the key to the success of BCG Economy Model (Calizo, 2022). Technology and innovation can create value, reduce waste, advance resource efficiency, promote sustainable business models,reducing inequality, innovation, along with supportive policies and stakeholder engagement, the BCG Economy Model can drive the transition towards a more economically prosperous, environmentally conscious, and inclusively society.

The following session discussed technology practices associated with the main industries in APEC economies from three key dimensions - economy, environment and society, that are the main outcomes of technological contribution to the BCG Economy Model. The model emphasized the interconnectedness of the economy, environment, and society. It recognized that sustainable development required considering the well-being of all three dimensions. By identifying the benefits in each aspect, a comprehensive and holistic evaluation of the technological contributions can be achieved. This approach ensured that the analysis encompasses the full spectrum of impacts and outcomes resulting from technology adoption in the BCG Economy Model.

Technologies contributing to economy

BCG technologies have demonstrated significant economic benefits. Advanced economies, which have been dedicated to sustainable development for decades, witnessed the prosperity of BCG-related technologies, resulting in direct economic advantages. For example, biotechnology, which serves sectors such as medicine, agriculture, and environmental management, has not only generated economic benefits for the companies directly involved but also created economic activities for their upstream and downstream non-biotechnology counterparts. This includes pharmaceutical companies, contract research organizations, and equipment manufacturers. The revenue and capital gains earned by all participants in these economic activities contributed to the overall economy. A report by the Biotechnology Innovation Organization and the Council of State Bioscience Associations showed that the U.S. bioscience industry's generated around USD3 trillion in 2021 (Biotechnology Innovation Organization, 2021).

In emerging economies, mature technologies like biomass and solar photovoltaic (PV) can be more readily adopted as they require less development and research. For instance, China benefited from economies of scale by importing foreign production machinery initially. With the development of efficient production processes, existing enterprises can trade worldwide at more competitive prices (UNCTAD, 2023). Mature technologies can achieve economies of scale more easily, making them feasible for practical implementation rather than remaining mere rhetoric.

Emerging industries in APEC economies, such as ICT industries, green hydrogen, bioethanol, solar PV, biomass, concentrating solar power, wind, and biogas, can contribute significantly to economic achievements (UNCTAD, 2023).

Technologies contributing to environment

Technologies associated with mitigation and adaptation play a crucial role in environmental conservation and sustainability. Mitigation technologies include renewable energy sources such as solar energy,wind energy, hydropower, geothermal energy, electric vehicles, and biomass technology. Carbon capture and storage, smart power grids, clean coal technologies, and green buildings also fall under this category. Green nanotechnologies have emerged to reduce energy and fuel usage by employing less material and renewable inputs (Verma et al., 2019).

Adaptation technologies involve reinforcing climate-resistant infrastructure, managing water, forests, and biodiversity, and utilizing industrial biotechnologies and nanotechnologies to develop drought-resistant crops and high-yield seeds (Lybecker & Lohse, 2015).

Technologies related to resource circulation and waste reduction, such as molecular technologies for purification systems and digital technologies for waste management and recycling, play a vital role in environmental conservation (OECD, 2021).

Environmental issues can have adverse economic effects. Technologies can address primary environmental issues while also benefiting the economy indirectly. Agrochemical technologies, such as fertilizers, pesticides, and herbicides, contribute to land productivity and reduce soil erosion and desertification, thereby mitigating economic losses caused by flooding. Digital technologies can decrease waste through inventory control and recycling, preventing

economic losses associated with improper waste management (Cho, 2019; WWF, 2023; McKinsey, 2016).

Technologies contributing to society

One of the key goals of the Thailand government in promoting the BCG Economy Model is leaving no one behind (NSTDA, 2021b), including distributing fair income and wealth to community, reducing inequality, and strengthening the grassroots through technology.

Job creation plays a significant role in alleviating poverty. The growth of biotechnology and renewable energy industries has the potential to generate employment opportunities (EY Report, 2000). In the USA, the biotech sector provided 2.1 millionjobs in 2021 in the USA and the job growth rose 11% since 2018 (Biotechnology Innovation Organization, 2021). Furthermore, digital technologies can replace human activities that are physically demanding, hazardous, or involve waste processing, leading to better working conditions and improved safety.

Addressing inequality across gender, income, and access to key services such as education, clean water, healthcare and a decent job, is a critical challenge in APEC economies. According to ESCAP research, there are stark gaps in access to 13 key opportunities in almost all developing economies in the Asia-Pacific region (ESCAP, 2018). Empowering vulnerable group therefore is important to promote social equality. Digital technologies empower vulnerable groups and help them with access to solutions for their specific needs. Open data initiatives can engage these groups in economic and social development (China Council for International Cooperation on Environment and Development Secretariat, 2023). In the Asia-Pacific region, still 1.5 billion people in rural areas and 600 million more in urban areas had limited access to water supply and sanitation (ADB, 2022). This is a continuous concern of APEC. An APEC workshop underlined that most APEC economies confront water shortage issues due to uneven distribution of water, increase in population and climate change (CNIS, 2023). The workshop recognized the importance of sustainable water management, irrigation management and recycled water. Technologies related to water management, such as nanotechnology in filtration and advanced sensors for water conservation and quality control, are essential in addressing this issue (ADB, 2022; CNIS, 2023).

Additionally, nanotechnology in energy access and healthcare, technologies for biological conservation, non-thermal food processing, and electronic and magnetic wave warming, and electrical and magnetic fields in food safety, can contribute to addressing social challenges in APEC economies.



4

SURVEY FINDINGS

The survey was conducted among individuals representing eleven APEC economies and one non-APEC economy, and different sectors to gather insights into the implementation and impact of the BCG Economy Model.

The results indicated that there was a widespread understanding of the model among the organizations surveyed. 90% of respondents recognized the integration of bio-economy, circular economy, and green economy principles in driving sustainable development. They appreciated the holistic approach of the model, which emphasizes the importance of economic, societal, and environmental considerations.

The following were the key results of the survey:

Sample Characteristics:

- Economy: The survey included 128 participants from a diverse range of economies, including Cambodia, Canada; Chile; China; Hong Kong, China; Indonesia; Malaysia; Mexico; Thailand; the Philippines; the United States; and Viet Nam.

- Model usage: The green economy model was the most popular model among the surveyed participants, with over 85% agreeing to its adoption. The circular economy model came in second, with 70% of participants in agreement. The bio-economy model was adopted by 45% of the participants.

Benefits of the BCG Economy Model:

- Economic benefit: Promoting growth (100%), economic enhancing resource efficiency (80%), and supporting innovation (65%), were identified as potential benefits of the model.

- Environmental benefit: Reducing waste and pollution (100%), promoting material reuse (83%), using renewable resources (75%), conserving natural resources (70%), and supporting innovation (65%), were identified as potential benefits of the model.

- Environmental benefit: Reducing waste and pollution (100%), promoting material reuse (83%), using renewable resources (75%), conserving natural resources (70%), and reducing dependence on fossil fuels (67%) were recognized as important environmental benefits.

- Societal benefit: Improving social well-being (95%), enhancing inclusiveness (80%), promoting equality (64%), and supporting vulnerable groups (43%) were highlighted as social benefits associated with the model.

Technologies Used and Metrics for Evaluation:

- Technologies used to enhance the BCG Economy Model included AI, big data and advanced analytics, blockchain, connectivity and network, IoT and smart devices, biotechnology, renewable energy, 3D printing and scanning, and others.

- Participants employed various metrics to evaluate the success of technology implementation, considering data and statistics related to economic benefits, environmental benefits, and societal benefits.

Impact on Vulnerable Groups:

- The survey explored whether the technology implemented in the BCG Economy Model had helped vulnerable groups. Women, elder citizens, people living in poverty, and micro, small, and medium enterprises (MSMEs), and startups were identified as vulnerable groups that could potentially benefit from the technology.

- Technologies such as AI, big data and advanced analytics, blockchain, IoT and smart devices, biotechnology, and renewable energy were recognized for their potential to empower and support these vulnerable groups.

Recommendations for APEC: Participants had several recommendations for APEC economies, including eliminating trade protection barriers, fostering public-private partnerships, facilitating trade and investment strategies, aligning regulations, promoting technological transfer, and investing in collaboration and open innovation. Further, the business community expressed a desire for support such as financial assistance, investment, co-investment, political support, intellectual property protection, market access, and technology support to further the goals of the BCG Economy Model.



5

INTERVIEW FINDINGS

In-depth interviews were conducted with nine experts from seven APEC economies, including China; Hong Kong, China; Japan; Singapore; Thailand; the United States; and Viet Nam. The selected experts represented diverse backgrounds, including government agencies, academia, industry practitioners, and consultants. The interviews aimed to gather detailed information on the key challenges, opportunities, strategies, and technologies in implementing the BCG Economy Model. The interviews took place between March and April 2023.

The findings from the interviews provide valuable insights into the implementation and promotion of the BCG Model. The experts' responses were analyzed and categorized into key themes, which are presented below:

Technologies in enhancing BCG economy model

- Digital technologies: All experts emphasized the transformative potential of digital technologies in enabling the model. They discussed the use of data analytics, IoT, AI, and blockchain to optimize resource utilization, enhance supply chain efficiency, protect environment, and promote sustainable production and consumption patterns.

- Biotechnology and circular economy solutions: Four experts recognized the significance of biotechnology and circular economy solutions in the model. They discussed applications in areas such as agriculture, healthcare, waste management, and materials recycling, highlighting the potential of biorefineries, bio-based materials, and sustainable production processes.

- Renewable energy: Experts highlighted the role of renewable energy technologies in promoting the model. They discussed advancements in solar, wind, and hydroelectric power, as well as emerging technologies such as hydrogen fuel cells and energy storage systems.

Key challenges in implementing BCG economy model

- Regulatory frameworks: Six experts highlighted the need for supportive regulatory frameworks encourage the adoption of BCG technologies and practices. They emphasized the importance of clear guidelines, policies, and standards to ensure compliance and facilitate the transition to a sustainable economy.

- Financing and investment: Four experts emphasized the importance of adequate funding and investment mechanisms to support BCG initiatives. They discussed the need for innovative financing models, public-private partnerships, and global cooperation to attract investments in sustainable technologies and infrastructure.

- Technology transfer and diffusion: Four experts identified challenges related to technology transfer and diffusion, particularly in developing economies. They discussed barriers such as limited access to advanced technologies, intellectual property rights issues, and the need for capacity building and knowledge transfer.

Strategies for promoting BCG economy model

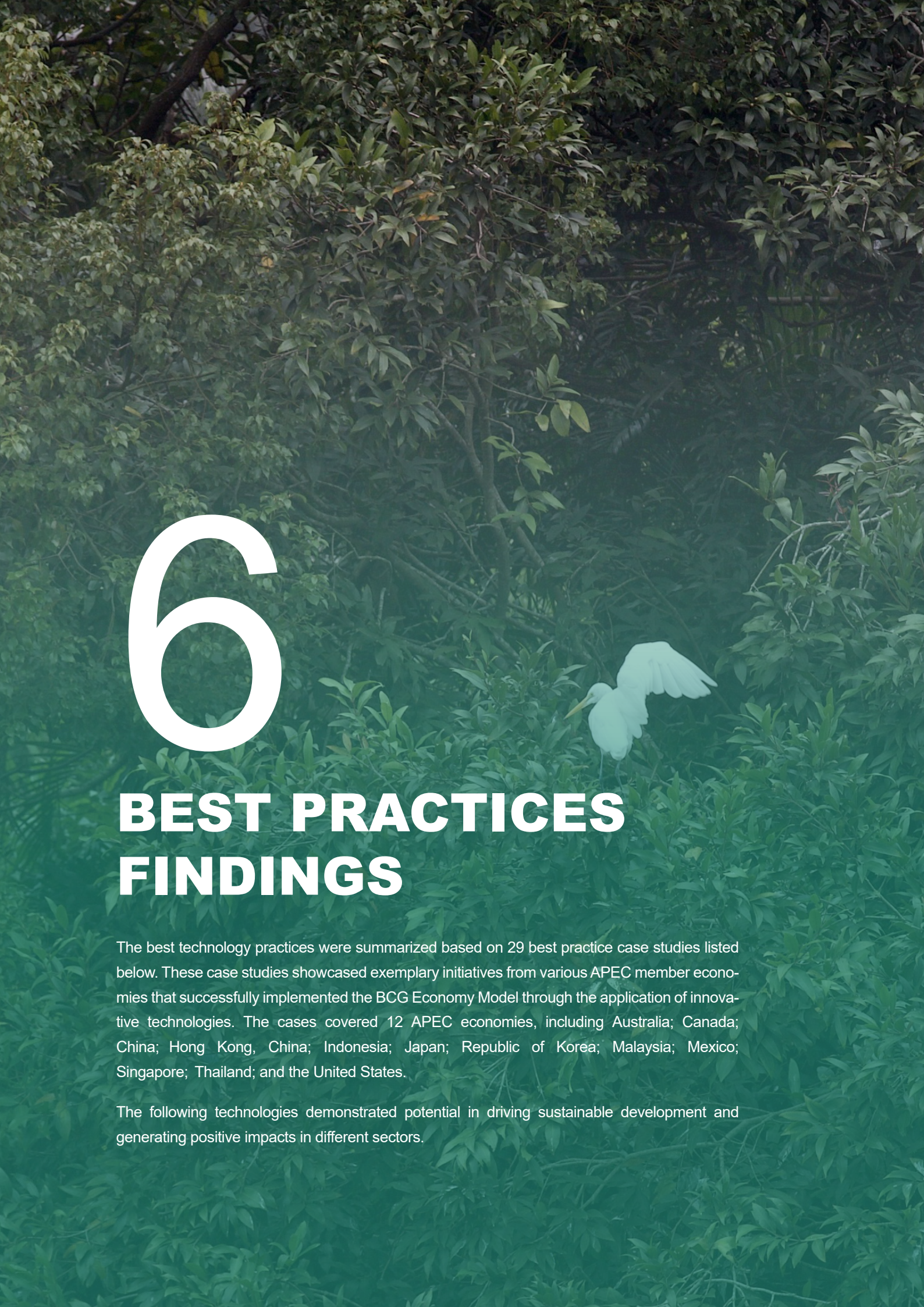
- Collaboration and partnerships: All experts highlighted the significance of collaboration and partnerships among stakeholders in APEC. They emphasized the need for multi-stakeholder engagement, knowledge sharing, and coordination to drive the implementation of the model. They discussed the importance of platforms, networks, and alliances to facilitate information exchange and joint initiatives.

- Capacity building and education: Six experts stressed the importance of capacity building and education to promote the model.They discussed

the need for training programs, awareness campaigns, and educational initiatives to enhance understanding and skills related to BCG principles and practices.

- Policy support and incentives: Six experts emphasized the role of policy support and incentives in driving the adoption of BCG technologies. They discussed the importance of government regulations, tax incentives, grants, and subsidies to encourage businesses and industries to embrace sustainable practices and invest in BCG initiatives.

The findings from the interviews provided valuable insights into the key challenges, opportunities, and strategies in implementing the model. They underscore the importance of supportive regulatory frameworks, technology transfer mechanisms, financing and investment, collaboration, capacity building, and the adoption of sustainable technologies. These insights can guide policymakers, practitioners, and stakeholders in promoting the model and driving the transition to a sustainable and inclusive economy.



6 BEST PRACTICES FINDINGS

The best technology practices were summarized based on 29 best practice case studies listed below. These case studies showcased exemplary initiatives from various APEC member economies that successfully implemented the BCG Economy Model through the application of innovative technologies. The cases covered 12 APEC economies, including Australia; Canada; China; Hong Kong, China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; Singapore; Thailand; and the United States.

The following technologies demonstrated potential in driving sustainable development and generating positive impacts in different sectors.

1 Agriculture and food industry

- Blockchain and smart contracts: These technologies, as demonstrated by AgriDigital in Australia, enhance transparency, efficiency, and trust in agricultural supply chains through secure transactions, traceability, and reduced fraud.

- IoT and data analytics: SomaDetect in Canada and Thai Union Group in Thailand utilize IoT devices and data analytics to optimize dairy farming practices and promote sustainable seafood sourcing, respectively. These technologies provide real-time information for better decision-making, improved productivity, and enhanced supply chain management.

- Vertical farming and hydroponics: BoomGrow in Malaysia implements vertical farming and hydroponic techniques, enabling sustainable agriculture and food security through optimized land use, reduced water consumption, and year-round crop production.

- Biotechnology: XiliNat in Mexico and Mitr Phol Sugar Corp., Ltd in Thailand harness biotechnology to produce natural sweeteners and improve sugar cane cultivation, respectively. These technologies promote healthier food choices, reduce environmental impact, and enhance crop yields.

- AI and image recognition: Rice Disease Bot in Thailand utilizes AI and image recognition technology to enhance rice crop health and productivity. This includes early disease detection, optimized pest management, and improved yield predictions.

2 Environment and energy industry

- Renewable energy solutions: Planet Ark in Australia and Terra Motors in Japan focus on renewable energy solutions such as solar power and electric vehicles. These technologies reduce greenhouse gas emissions, promote clean energy generation, and contribute to a sustainable and low-carbon economy.

- Carbon capture and utilization: CarbonCure Technologies in Canada develops innovative carbon capture and utilization techniques for the concrete industry. By sequestering carbon dioxide emissions and incorporating them into concrete products, this technology reduces carbon footprints and promotes circular economy principles.

- Smart home and energy management: Ecobee in Canada offers smart thermostats and home energy management systems. These technologies optimize energy usage, improve energy efficiency, and enable users to make informed decisions for reducing energy consumption and costs.

- Robotics and automation: SOTA Robotics in Hong Kong applies robotics and automation to waste management and recycling processes. These technologies enhance efficiency, reduce human labor, and improve waste sorting accuracy, leading to effective waste management and resource recovery.

- Sustainable packaging: AlterPacks in Singapore focuses on sustainable packaging solutions, utilizing biodegradable and compostable materials. This technology reduces plastic waste, promotes circular economy practices, and minimizes environmental impacts.

3 Biotechnology industry

- Quantum biotechnology: Quantum Biotech in Thailand utilizes quantum computing and biotechnology to accelerate drug discovery and development processes. This technology enables faster and more accurate analysis of complex biological data, leading to the development of innovative drugs and therapies.

- Personalized genetics: Genoplan in the Republic of Korea specializes in personalized genetics and genetic testing services. Biotech Global Innovation Company in Thailand focuses genetic engineering, synthetic biology, and precision medicine. By analyzing individual genetic profiles, this technology provides insights into personalized healthcare, disease prevention, and lifestyle choices.

- Biomaterials and sustainable production: Spiber Inc. in Japan focuses on the development of biomaterials derived from proteins produced by microorganisms.The company' s technology enables sustainable production methods, reduces reliance on traditional materials, and offers new possibilities in industries such as textiles and materials science.

4 Technology industry

- AI and machine learning: Skelter Labs and Naver Cloud AI Innovation in the Republic of Korea leverage AI and machine learning technologies. These technologies enable advanced data analytics, natural language processing, and predictive modeling, empowering businesses to make data-driven decisions, improve customer experiences, and optimize operations.

- Mobile payment systems: Weixin Pay in China is a mobile payment platform that utilizes mobile and digital wallets to enable seamless and convenient transactions. This technology facilitates secure and efficient financial transactions, enhances financial inclusion, and promotes cashless economies, resulting a low-carbon economy.

- Advanced manufacturing and remanufacturing: The Advanced Remanufacturing and Technology Centre (ARTC) in Singapore focuses on advanced manufacturing technologies such as automation, robotics, and additive manufacturing (3D printing). These technologies enhance productivity, enable flexible manufacturing processes, and support sustainable production through remanufacturing and circular economy practices.

- Blockchain: Hyperchain, a pioneering entity in the realm of blockchain technology, has harnessed its innovative prowess to make profound strides in environmental management and carbon emission reduction. By integrating blockchain's immutable and transparent ledger system, Hyperchain has enabled streamlined tracking and validation of environmental data, facilitating enhanced supply chain transparency and accountability.

❺ Supply chain industry

- Digital platform and mobile app: TheLorry.com in Malaysia utilizes a digital platform and mobile app to connect customers with logistics service providers. This technology streamlines the supply chain process, improves transparency, and enables efficient and cost-effective logistics management.

- QR code technology: GS1 Hong Kong employs QR code technology in supply chain management. QR codes serve as unique identifiers for products, enabling efficient tracking and tracing throughout the supply chain. This technology enhances supply chain visibility, improves product authentication, and facilitates inventory management.

- E-commerce and online marketplaces: JD.com in China operates as an e-commerce and online marketplace platform. By leveraging digital technologies, JD.com facilitates seamless transactions, connects buyers and sellers, and optimizes supply chain operations. This technology enables efficient inventory management, supports cross-border trade, and fosters business growth.

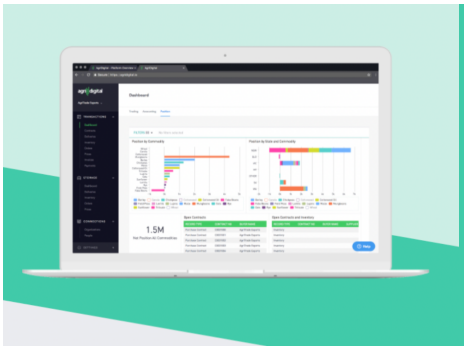
❻ Tourism industry

- Digital Transformation: Embracing digital technologies, online platforms, and mobile applications to enhance tourism experiences, streamline bookings, provide personalized recommendations, and enable seamless communication with tourists.

- Smart Tourism: Beijing Shougang Park in China utilizes smart tourism technology to enhance the visitor experience and optimize park operations. This technology includes features such as mobile apps, augmented reality (AR), virtual reality (VR), and interactive displays. These technologies provide visitors with interactive and immersive experiences, enable easy access to information and services, and enhance overall visitor satisfaction.

- Cultural Heritage Preservation: Utilizing technologies such as virtual reality, augmented reality, and digital archives to preserve and promote cultural heritage, enabling virtual tours, interactive exhibits, and immersive storytelling.

These study findings highlighted the key technologies that demonstrated significant potential in driving sustainable development across different industries within the BCG Economy Model. By adopting and integrating these technologies effectively, economies can leverage their benefits to promote economic growth, environmental stewardship, and societal well-being while fostering a more sustainable and inclusive future.



Agriculture and food: AgriDigital

Member Economy: Australia

Introduction

AgriDigital was launched in 2016 as a technology company focused on revolutionizing supply chain management in the agricultural sector. The company serves farmers and supply chain participants across various regions, facilitating the efficient and transparent movement of agricultural commodities.

Activities in the BCG Economy Model

It has leveraged technology to improve supply chain efficiency and sustainability in the food and agriculture sector. The company provides digital platforms and solutions that enable farmers and other stakeholders to manage their commodity transactions, track product provenance, and ensure traceability throughout the supply chain.

Technology Innovativeness

AgriDigital has implemented innovative measures and technology to transform supply chain management. The company has leveraged blockchain technology, smart contracts, and digital platforms to streamline processes, automate transactions, and enable real-time tracking and reporting of agricultural commodities. These technological advancements contributed to increased efficiency, accuracy, and trust within the supply chain. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Its' technology-driven solutions have brought significant economic benefits to the agricultural sector. The streamlined supply-chain processes and improved transparency result in reduced transaction costs, enhanced market access, and improved pricing mechanisms for farmers and other stakeholders. The efficient management of commodities through AgriDigital's platforms leads to cost savings, increased productivity, and improved profitability for participants in the agricultural supply chain.

Environmental Benefits

AgriDigital's digital platforms and traceability solutions contribute to environmental benefits. By enabling accurate and transparent tracking of commodities, the company supports sustainable sourcing, reduces waste, and facilitates the implementation of environmentally friendly practices. The enhanced supply chain visibility also enables better management of resources, reducing the environmental impact associated with agricultural production and distribution.

Societal Benefits

It provides social benefits to the community by promoting fair and transparent practices in the agricultural supply chain. The company's platforms empower farmers, particularly small-scale farmers, with access to market information, fair pricing, and improved market opportunities. AgriDigital's solutions also facilitate the adoption of sustainable and ethical practices, ensuring the delivery of safe and quality food to consumers.



Agriculture and food: SomaDetect

Member Economy: Canada

Introduction

SomaDetect was launched in Canada in 2017. The company was founded with the mission of revolutionizing dairy farming by providing real-time, actionable insights through advanced technology. The company collaborates with dairy farmers and industry partners worldwide to implement its technology and improve milk production practices, addressing the challenges faced by dairy farmers in monitoring the health and quality of their herds' milk. The company aimed to provide farmers with accurate, timely data to optimize milk production, enhance animal welfare, and improve farm sustainability.

Activities in the BCG Economy Model

SomaDetect applies advanced technology in the dairy industry. The company utilizes artificial intelligence, machine learning, and sensor technology to analyze milk composition, herd health, and reproductive status in real-time.

Technology Innovativeness

SomaDetect implements innovative measures and cutting-edge technology to achieve its goals. The company's proprietary sensor technology and machine learning algorithms enable the rapid and non-invasive analysis of milk quality and cow health. This innovative approach revolutionizes traditional dairy farming practices and empowers farmers with data-driven decision-making tools. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

SomaDetect's technology brings economic benefits to dairy farmers by optimizing milk production and improving herd management practices. The real-time monitoring and actionable insights enable farmers to detect health issues early, optimize breeding-programs, and ensure milk quality, resulting in increased productivity, reduced costs, and enhanced profitability.

Environmental Benefits

SomaDetect's technology indirectly contributes to environmental benefits by improving dairy farm efficiency and reducing waste. By enabling farmers to monitor herd health more effectively, the company helps minimize the use of antibiotics and other inputs, leading to a more sustainable and environmentally-friendly approach to dairy farming.

Societal Benefits

SomaDetect provides social benefits to the dairy farming community by promoting animal welfare, supporting sustainable farming practices, and ensuring the production of high-quality milk. By empowering farmers with technology and knowledge, SomaDetect contributes to the long-term viability and success of dairy farming, benefiting rural communities and consumers.



Agriculture and food: BoomGrow

Member Economy: Malaysia

Introduction

In 2019, BoomGrow marked its successful commercialisation of the Machine Farm technology nested under the Domestic 5G Demonstration Project (5GDP) in Langkawi undertaken by the Malaysia Communications and Multimedia Commission (MCMC). The company was founded with the aim of using precision farming solutions to create a more sustainable and productive food supply chain agricultural sector, with no pesticides and kinder to the environment. In doing so, it addresses the challenges faced by traditional food supply models, such as resource inefficiencies, environmental degradation and low productivity.

Activities in the BCG Economy Model

BoomGrow's main activities align with the BCG Economy Model by promoting sustainable agriculture and enhancing resource efficiency. The company utilizes advanced technology, such as precision farming techniques, IoT (Internet of Things) sensors, and data analytics, to optimize crop production, minimize resource wastage, and reduce environmental impact.

Technology Innovativeness

It implements innovative measures and technologies in its patent pending Machine Farm system by leveraging on precision farming techniques, which involve the use of IoT sensors, and data analytics to monitor and optimize crop growth. Additionally, it prioritizes direct on-site food production to minimize the carbon footprint traditionally contributed by long distance food miles. Its innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

BoomGrow's technology-driven approach brings economic benefits to developing economies by training next generation agronomists and farmers, improving crop yields, reducing input costs, and enhancing overall industry profitability. The company's solutions enable end users to optimize the use of resources, minimize wastage, and increase their productivity and income potential.

Environmental Benefits

It promotes sustainable agriculture practices that minimize resource wastage and reduce environmental impact. Through precision farming techniques, the company helps farmers optimize resource usage. By eliminating the usage of pesticide and herbicides, the Machine Farm improves the health of farmers and consumers who are both no longer exposed to potentially harmful chemicals. A Machine Farm is 95% more space efficient than a traditional farm with 95% less water usage and 95% less shipping fuel. This significant space optimization minimizes the footprint required for production; conserving water, preventing soil degradation and preserving the natural biodiversity of uncleared land.

Societal Benefits

BoomGrow's core mission is to enable access to fresh and pesticide-free produce to the community. Through technology adaptation, the company community trains next generation agronomists and farmers to improve their income and achieve greater financial stability. Additionally, its' initiatives foster knowledge sharing and capacity-building among the community, promoting the exchange of best practices and enhancing community resilience.



Agriculture and food: XiliNat

Member Economy: Mexico

Introduction

XiliNat was initiated in 2015 and officially launched its operations in Mexico in 2016. The company was founded to address the growing demand for natural sweeteners as an alternative to artificial and refined sugars, and contribute to the reduction of agricultural waste. XiliNat sought to promote sustainable agricultural practices and improve the well-being of consumers through the production of natural sweeteners.

Activities in the BCG Economy Model

XiliNat's main activities align with the BCG Economy Model by promoting sustainable agriculture, reducing waste, and offering healthier food alternatives. The company specializes in the production of xylitol, a natural sweetener derived from agricultural residues. By utilizing these residues, XiliNat contributes to the circular economy by reducing waste and utilizing resources efficiently.

Technology Innovativeness

XiliNat implements innovative measures and technology in its production processes. The company utilizes advanced extraction techniques to extract xylitol from agricultural residues efficiently. Additionally, it employs quality control measures and research-based approaches to ensure product consistency and improve its offerings continuously. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

XiliNat's technology-driven approach brings economic benefits by creating new market opportunities for natural sweeteners. The company has witnessed significant growth and market expansion, leading to increased revenue streams and job creation within the food industry. Its' success demonstrates the economic viability of sustainable food production practices.

Environmental Benefits

It provides environmental benefits through its focus on sustainable agriculture and waste reduction. By utilizing agricultural residues as raw materials, the company reduces waste and minimizes the environmental impact of traditional agricultural practices. Additionally, the production of natural sweeteners promotes biodiversity by reducing the need for intensive monoculture farming.

Societal Benefits

XiliNat's activities provide social benefits to the community by promoting healthier food choices. The company's natural sweeteners offer an alternative to refined sugars, contributing to the prevention of diet-related diseases and improving overall well-being. It also supports local farmers and agricultural cooperatives, enhancing livelihoods and fostering community development.



Agriculture and food: Mitr Phol Sugar Corp., Ltd.

Member Economy: Thailand

Introduction

Mitr Phol Sugar Corp., Ltd. was established in 1946 and has since become one of the leading sugar producers in Thailand. The company embarked on its sustainability journey and adoption of technology-driven practices in the early 2000s. The implementation of sustainable practices and technological advancements has been an ongoing process for Mitr Phol.

Activities in the BCG Economy Model

Mitr Phol's main activities align with the principles of the BCG Economy Model by focusing on sustainable sugar production. The company implements innovative measures and technologies to enhance resource efficiency, reduce environmental impact, and improve the well-being of local communities. This includes the adoption of precision farming techniques, renewable energy utilization, waste management practices, and community engagement initiatives.

Technology Innovativeness

Mitr Phol implements various innovative technologies throughout its sugar production process. These include precision agriculture techniques, such as satellite mapping and soil sensors, to optimize irrigation and fertilizer application. The company also utilizes renewable energy sources, such as biogas and solar power, to meet its energy needs. Advanced waste management systems and digital monitoring platforms further enhance operational efficiency and sustainability.

Economic Benefits

The adoption of technology-driven sustainable practices has yielded significant economic benefits. The company has achieved cost savings through improved resource efficiency, reduced energy consumption, and enhanced productivity. By optimizing sugar production processes and reducing waste, it has increased profitability and maintained its competitive edge in the market.

Environmental Benefits

Mitr Phol's sustainable sugar production practices contribute to several environmental benefits. The company has implemented precision agriculture techniques to minimize water usage, reduce chemical inputs, and mitigate soil erosion. Renewable energy utilization helps reduce greenhouse gas emissions and reliance on fossil fuels. Furthermore, its' waste management practices focus on recycling and reusing by-products, minimizing environmental impact and promoting circular economy principles.

Societal Benefits

Mitr Phol's commitment to sustainability extends to social community and societal benefits. The company actively engages with local communities, supporting education programs, healthcare initiatives, and infrastructure development. By promoting sustainable agriculture, it contributes to food security, supports rural livelihoods, and fosters social well-being in the regions where it operates.



Agriculture and food: Rice Disease Bot

Member Economy: Thailand

Introduction

Rice Disease Bot was initiated in 2019 and finally launched in 2021. It was founded as a private startup company with a mission to address rice crop diseases using innovative technology solutions. By developing a technology-driven solution, the company aimed to empower farmers with real-time disease detection and diagnosis capabilities, ultimately improving crop yields, reducing losses, and promoting sustainable agricultural practices.

Activities in the BCG Economy Model

Rice Disease Bot's main activities align with the BCG Economy Model by leveraging technology to address agricultural challenges, specifically rice crop diseases. The company develops and deploys AI-powered systems that can detect and diagnose diseases in rice crops, enabling early intervention and efficient resource allocation.

Technology Innovativeness

Rice Disease Bot implements innovative measures and technology in its solution. The company utilizes artificial intelligence, machine learning, and image recognition algorithms to analyze visual data from rice crops and identify disease symptoms accurately. By automating the disease detection process, Rice Disease Bot provides a faster and more efficient way to manage crop diseases.

Economic Benefits

It brings economic benefits to farmers by helping them mitigate crop losses caused by diseases. Early disease detection allows farmers to take timely action, minimizing yield reduction and lowering production costs associated with disease management. By safeguarding crop productivity, the technology contributes to increased farm income and overall agricultural sector growth.

Environmental Benefits

Rice Disease Bot provides environmental benefits by supporting sustainable farming practices. By accurately detecting and diagnosing diseases, farmers can target interventions, such as pesticide application, reducing the number of agrochemicals used. This promotes environmentally friendly farming practices, minimizes chemical runoff into water bodies, and preserves ecosystem balance.

Societal Benefits

Rice Disease Bot provides social community and societal benefits by empowering all farmers, including small-scale and vulnerable farming communities, and promoting food security. The technology helps farmers protect their livelihoods and improve their economic well-being. Additionally, by enhancing crop health and productivity, Rice Disease Bot contributes to ensuring a stable and sufficient food supply for local communities.



Agriculture and food: Thai Union Group

Member Economy: Thailand

Introduction

Thai Union Group was initiated in 1977 and has since become one of the world's largest seafood companies. It sources seafood from various regions, processes it in different locations, and distributes products to markets worldwide. Its transformation and focus on sustainability were gradually implemented over the years. It helps to address environmental challenges facing the seafood industry, enhance its reputation and market position, meet consumer demands for sustainable products, and contribute to the long-term viability of marine ecosystems and communities dependent on them.

Activities in the BCG Economy Model

Thai Union Group's main activities align with the BCG Economy Model by adopting sustainable practices and leveraging technology to improve efficiency and reduce environmental impact throughout the seafood value chain. The company focuses on responsible sourcing, sustainable production, and innovation in food processing and packaging.

Technology Innovativeness

Thai Union Group actively implements innovative measures and technology throughout its operations. It utilizes advanced fishing techniques, including satellite tracking and fish aggregating devices, to promote responsible fishing practices. The company also employs cutting-edge processing technologies to optimize production efficiency, reduce waste, and improve the quality and safety of its seafood products. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

The adoption of sustainable practices and technological innovations has provided economic benefits to Thai Union Group. The company has secured market access and premium pricing for its sustainably sourced and traceable seafood products. By improving operational efficiency, reducing waste, and enhancing product quality, Thai Union Group has achieved cost savings and increased profitability.

Environmental Benefits

Thai Union Group's commitment to sustainability brings significant environmental benefits. The company focuses on responsible fishing practices to preserve fish stocks and reduce bycatch. It invests in wastewater treatment systems, energy-efficient facilities, and renewable energy sources to minimize its environmental footprint. Thai Union Group also collaborates with stakeholders to promote ecosystem conservation and marine biodiversity.

Societal Benefits

Thai Union Group provides social benefits to the community by supporting the livelihoods of fishermen, fostering partnerships with local communities, and investing in social programs focused on education, health, and well-being. The company engages in responsible labor practices, ensuring fair treatment, and safe working conditions for its employees and suppliers.



Environment and energy: Planet Ark

Member Economy: Australia

Introduction

Planet Ark was initiated in 1992 as an environmental not-for-profit organization and officially launched in the same year. It has since been at the forefront of promoting sustainability practices and raising environmental awareness in Australia. The organization's key motivations include mitigating climate change, conserving natural resources, protecting biodiversity, and promoting a more sustainable and resilient future for individuals, communities, and the planet.

Activities in the BCG Economy Model

Planet Ark's main activities align with the BCG Economy Model by championing sustainable practices across various sectors. The organization develops and promotes innovative solutions, conducts research, and provides education and resources to enable individuals and businesses to adopt sustainable practices, reduce waste, and minimize environmental impact.

Technology Innovativeness

Planet Ark leverages innovative measures and technology to achieve its goals. The organization utilizes digital platforms, data analytics, and information systems to disseminate information, provide guidance on sustainable practices, and facilitate behavior change. It embraces emerging technologies and tools to amplify its impact and drive environmental sustainability. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Planet Ark's initiatives generate economic benefits by helping businesses adopt sustainable practices, reduce waste, and improve resource efficiency. By implementing environmentally friendly strategies, businesses can achieve cost savings, enhance their brand reputation, and tap into new market opportunities driven by the growing demand for sustainable products and services.

Environmental Benefits

Planet Ark delivers significant environmental benefits through its initiatives. These include reducing carbon emissions, promoting recycling and waste reduction, conserving natural resources, and protecting ecosystems. The organization's efforts contribute to addressing environmental challenges and fostering a more sustainable and resilient natural environment.

Societal Benefits

Planet Ark provides social and societal benefits by engaging and educating the community on environmental sustainability, including vulnerable groups. The organization promotes behavior change, encourages responsible consumption, and empowers individuals to make sustainable choices. By raising awareness and fostering environmental stewardship, Planet Ark positively impacts society by creating a more environmentally conscious and engaged community.



Environment and energy: CarbonCure Technologies

Member Economy: Canada

Introduction

CarbonCure is on a mission to make concrete a climate solution and reduce and remove from the atmosphere 500 million metric tons annually. The company's suite of innovative carbon dioxide (CO_2) utilization technologies help address the environmental impact of concrete production. Their clients include hundreds of concrete producers across more than 30 economies, and end users that include construction companies, engineers, architects, and developers. To date, CarbonCure and its network of concrete producer partners have delivered more than five million truckloads of lower carbon concrete made with these technologies.

Activities in the BCG Economy Model

CarbonCure's innovative technologies are a direct way to reduce embodied carbon emissions. Its most widely deployed concrete mixer technology is retrofitted into concrete plants and enables concrete producers to inject captured CO_2 into fresh concrete during mixing. Once injected, the CO_2 reacts with the concrete mix and immediately becomes a mineral that is permanently embedded. The company's reclaimed water technology is also retrofitted to agitator slurry tanks that transforms cementitious content and water into reliable and profitable upcycled resources that can be reused and have no impact on the fresh or hardened properties of concrete. Thanks to these technologies, CarbonCure enables concrete producers to reduce their operating costs, improve their profitability and contribute to a more sustainable built environment.

Technology Innovativeness

CarbonCure Technologies implements innovative measures and technology by introducing a novel approach to carbon capture and utilization in the concrete industry. Their technology leverages the natural mineralization process of CO_2 within the concrete, resulting in a permanent reduction of carbon emissions and enhancing the material's performance. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

These technologies provide economic benefits to concrete producers. By maximizing the performance of concrete via carbon mineralization, producers can reduce cement content and associated costs; they can also tap into surging demand for low carbon building materials.

Environmental Benefits

CarbonCure's technologies provide significant environmental benefits. By injecting captured CO_2 into concrete, the process permanently sequesters residual carbon emissions and avoids new emissions by using less cement. This results in a net reduction of greenhouse gas emissions, reducing the environmental impact of the concrete industry.

Societal Benefits

It positively impacts the community by creating healthier built environments and promoting a more sustainable construction sector. Its solution is fostering a Green Transition in an industry with hard to abate emissions without jeopardizing businesses or hurting workers.



Environment and energy: Ecobee

Member Economy: Canada

Introduction

Ecobee was launched in 2007. The company was founded with the mission to develop innovative technologies that promote energy efficiency and sustainability. It addresses the growing energy consumption and environmental challenges faced by households and businesses. The company aims to provide accessible and user-friendly technologies that empower individuals to make sustainable choices and reduce their carbon footprint.

Activities in the BCG Economy Model

Ecobee's main activities align with the BCG Economy Model by focusing on developing and implementing innovative technologies to improve energy efficiency and reduce environmental impact. The company specializes in smart thermostats and home automation systems that enable users to optimize energy consumption, reduce greenhouse gas emissions, and save costs.

Technology Innovativeness

It implements innovative measures and technology through its smart thermostats and home automation systems. These solutions leverage advanced sensors, machine learning algorithms, and cloud-based platforms to optimize heating, cooling, and energy usage in buildings. Ecobee continuously innovates its products to incorporate the latest technological advancements and enhance energy efficiency. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Ecobee's technology offers economic benefits to users by helping them reduce energy consumption and save on utility costs. The smart thermostats enable efficient temperature control, allowing users to optimize their heating and cooling usage based on occupancy and preferences. By reducing energy waste, it helps customers achieve long-term cost savings and improved financial sustainability.

Environmental Benefits

It provides significant environmental benefits by enabling energy efficiency and reducing greenhouse gas emissions. The company's smart thermostats optimize energy consumption, leading to reduced reliance on fossil fuels and decreased carbon emissions. Additionally, by promoting sustainable practices and raising awareness of energy conservation, Ecobee contributes to mitigating the environmental impact of residential and commercial buildings.

Societal Benefits

It delivers social and societal benefits by empowering individuals to actively participate in sustainability efforts. Their technology enhances environmental consciousness and encourages behavioral changes toward more energy-efficient practices. By promoting energy literacy and providing accessible tools, Ecobee fosters a sense of responsibility and engagement within the community.



Environment and energy: SOTA Robotics

Member Economy: Hong Kong, China

Introduction

SOTA Robotics HK Limited was initiated in 2022 as a technology startup focused on developing innovative solutions for waste management and recycling. The company launched its intelligent recognition and robot sorting technology in 2023. It addresses the challenges in waste management and recycling, including inefficient manual sorting processes, contamination of recyclable materials, and the need to improve recycling rates. The company aims to increase recycling efficiency, reduce waste sent to landfills, and promote a circular economy. Its' clients include waste management authorities, recycling facilities, and waste collection operators.

Activities in the BCG Economy Model

SOTA Robotics' main activity is the development and deployment of intelligent recognition and robot sorting technology for waste management and recycling. The technology utilizes AI and computer vision algorithms to accurately identify and sort different types of waste materials, such as plastics, metals, and paper. This automated sorting process enhances recycling efficiency and reduces waste contamination.

Technology Innovativeness

The waste sorting solution is fully automated and digitized, utilizing AI and robotics technology. MightySort is the backend robotic sorting system for materials recovery facilities (MRFs). Equipped with a high-speed vision module and delta robots, the system can recognize over 100 types of waste in various categories, including scrap metal, e-waste, municipal waste, and construction waste. Using adaptive grasp estimation, the patented multifunctional robot hand grasps and sorts the waste into corresponding compartments. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

The implementation of the intelligent recognition and robot sorting technology brings several economic benefits. It improves the efficiency of waste sorting processes, reducing labor costs and increasing recycling rates. The recognition AI achieves superhuman accuracy of around 95%, and the system can perform up to 6000 picks per hour with an optimized grasp-and-throw strategy. Thanks to its high performance, the system can replace six human workers and decrease recycling costs by 70%. The recovered materials can be sold at higher market values, generating additional revenue streams for recycling facilities and waste collection operators. Moreover, the technology creates opportunities for job growth in the robotics and waste management sectors.

Environmental Benefits

The intelligent recognition and robot sorting technology contributes to environmental benefits by enhancing recycling rates and reducing waste contamination. By accurately identifying and sorting recyclable materials, it increases the quantity and quality of recovered materials, minimizing the need for virgin resource extraction. This reduces the environmental impact associated with the production of new materials.

Societal Benefits

The technology provides social benefits to the community by improving waste management practices and promoting sustainability. It helps create cleaner and healthier environments by reducing the amount of waste sent to landfills and minimizing pollution risks. Additionally, the technology raises awareness about the importance of recycling and encourages responsible waste disposal behavior among individuals and communities.



Environment and energy: KIS Group

Member Economy: Indonesia

Introduction

KIS Group was initiated in 2005 with the vision of transforming waste management practices in Indonesia. The company was officially launched in 2007, providing innovative waste management solutions to various sectors. The company aimed to provide innovative and sustainable solutions to promote a cleaner and healthier environment, conserve resources, and contribute to the well-being of local communities. It serves a wide range of clients, including commercial enterprises, residential communities, and public institutions.

Activities in the BCG Economy Model

KIS Group's main activities revolve around waste management and environmental services in alignment with the BCG Economy Model. The company implements innovative measures and technologies to enhance waste collection, sorting, recycling, and disposal processes. By promoting the principles of a circular economy, KIS Group aims to minimize waste generation, conserve resources, and reduce environmental impact.

Technology Innovativeness

KIS Group implements innovative measures and technologies throughout its waste management operations. This includes the use of advanced waste sorting systems, IoT-enabled sensors for smart waste collection, and automated recycling processes. The company also utilizes data analytics and digital platforms to optimize waste management strategies and improve operational efficiency. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

The technology-driven waste management practices by KIS Group yield several economic benefits. By implementing efficient waste collection and recycling systems, the company reduces waste disposal costs for clients. Additionally, KIS Group generates revenue from the sale of recycled materials and by-products, contributing to a more circular and sustainable economy.

Environmental Benefits

KIS Group's waste management practices provide significant environmental benefits. By promoting waste reduction, recycling, and proper disposal, the company helps minimize environmental pollution and landfill usage. The efficient sorting and recycling processes contribute to resource conservation and reduced reliance on raw materials. Moreover, KIS Group actively educates the community on waste management and environmental conservation, fostering a culture of sustainability.

Societal Benefits

KIS Group's waste management practices offer several social community and societal benefits. The company collaborates with local communities to raise awareness about waste management and promote responsible waste disposal practices. KIS Group also creates employment opportunities in waste collection, recycling, and related services, supporting local livelihoods and social development.



Environment and energy: Terra Motors

Member Economy: Japan

Introduction

Terra Motors was initiated in 2010 and officially launched in 2012. It was founded as a private company with a focus on developing electric vehicles and sustainable transportation solutions. The company's products and technologies are designed to address transportation associated with traditional gasoline-powered vehicles, such as air pollution and carbon emissions. The company aimed to develop and promote affordable electric vehicles as a sustainable and efficient alternative to fossil fuel-powered transportation.

Activities in the BCG Economy Model

Terra Motors' main activities align with the BCG Economy Model by focusing on the development and production of electric vehicles (EVs) and related technologies. The company designs and manufactures electric scooters, motorcycles, and utility vehicles that reduce carbon emissions and promote sustainable mobility solutions.

Technology Innovativeness

Terra Motors implements innovative measures and technology in its electric vehicles. The company focuses on developing advanced battery technologies, energy-efficient drivetrains, and smart connectivity features. By leveraging cutting-edge technology, Terra Motors enhances the performance, range, and reliability of its electric vehicles. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Its' electric vehicles offer economic benefits by reducing fuel costs and operating expenses compared to traditional gasoline-powered vehicles. Electric vehicles require less maintenance, have lower operating costs, and can contribute to energy independence by utilizing renewable energy sources for charging. Furthermore, the production and adoption of electric vehicles create job opportunities and stimulate economic growth in the clean transportation sector.

Environmental Benefits

Terra Motors' electric vehicles provide significant environmental benefits by reducing carbon emissions and air pollution. By replacing gasoline-powered vehicles with electric alternatives, the company helps mitigate the adverse effects of transportation on climate change and promotes cleaner air quality. Electric vehicles produce zero tailpipe emissions and contribute to the reduction of greenhouse gas emissions.

Societal Benefits

Its' electric vehicles contribute to the social benefit of the community by promoting affordable and sustainable transportation solutions. The use of electric vehicles reduces noise pollution, creating quieter and more livable urban environments. Additionally, Terra Motors actively engages with local communities and organizations to raise awareness about the environmental benefits of electric vehicles and promote sustainable mobility options.



Environment and energy: AlterPacks

Member Economy: Singapore

Introduction

AlterPacks was initiated in 2018 and finally launched in 2020. It was founded as a private company with a focus on sustainable packaging solutions. The company aims to address global packaging challenges and contribute to the global shift towards sustainable packaging solutions. The company aimed to develop sustainable packaging solutions that reduce waste, promote resource efficiency, and minimize the ecological footprint of packaging throughout its lifecycle. Its' clients include consumer goods companies, retailers, regulatory bodies, and environmentally conscious consumers.

Activities in the BCG Economy Model

AlterPacks' main activities align with the BCG Economy Model by providing sustainable packaging solutions. The company utilizes innovative technologies and materials to develop environmentally friendly packaging alternatives. By focusing on reducing waste and promoting circular economy principles, it contributes to the transition towards a more sustainable and resource-efficient economy.

Technology Innovativeness

It implements innovative measures and technologies in its packaging solutions. The company explores alternative materials, such as biodegradable and compostable polymers, and incorporates advanced design and manufacturing techniques to create sustainable packaging options. By leveraging cutting-edge technology, AlterPacks enhances the functionality, performance, and environmental sustainability of packaging solutions. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

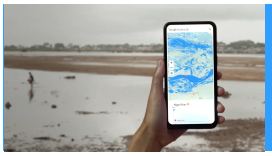
Its' sustainable packaging solutions offer economic benefits by helping companies reduce packaging waste, optimize supply chains, and enhance their brand reputation. By adopting environmentally friendly packaging alternatives, businesses can improve their operational efficiency, appeal to eco-conscious consumers, and reduce costs associated with waste management and disposal.

Environmental Benefits

AlterPacks provides significant environmental benefits through its sustainable packaging solutions. By utilizing biodegradable and compostable materials, the company reduces the reliance on non-renewable resources and minimizes the environmental impact of packaging waste. Moreover, it promotes circular economy principles by designing packaging that can be recycled, reused, or safely returned to the ecosystem.

Societal Benefits

AlterPacks contributes to the community by raising awareness about sustainable packaging practices and promoting responsible consumption. The company's eco-friendly packaging solutions enable consumers to make environmentally conscious choices and align their purchasing decisions with their values. Further, it actively engages vulnerable groups and encourages their participation in sustainability initiatives. AlterPacks promotes dialogue, education, and partnerships to ensure that diverse perspectives are considered in the development and adoption of sustainable packaging solutions. By reducing packaging waste and supporting a circular economy, it fosters a more sustainable and resilient society.



Environment and energy: Google Flood Forecasting

Member Economy: The United States

Introduction

The Google Flood Forecasting Team was initiated within Google's larger organization and is an ongoing project focused on using technology to predict and mitigate the impacts of flooding, initially focusing on flood-prone regions in the United States. The team began its work in 2017 and continues to develop and improve its flood forecasting capabilities. It aims to use its technological capabilities to provide accurate and timely flood predictions, enabling proactive measures to protect lives and minimize property damage. Key stakeholders involve government agencies responsible for disaster management, local communities at risk of flooding, and organizations involved in emergency response and preparedness.

Activities in the BCG Economy Model

The Google Flood Forecasting Team's main activities align with the BCG Economy Model by utilizing technology and data analytics to predict and mitigate the impacts of flooding. The team develops sophisticated flood forecasting models that leverage machine learning algorithms, satellite imagery, and historical weather data to generate accurate flood predictions. By providing timely and accurate information, the team helps governments, emergency responders, and communities prepare for and respond to flood events effectively.

Technology Innovativeness

The Google Flood Forecasting Team implements innovative measures and cutting-edge technology in its flood forecasting activities. Leveraging machine learning algorithms, artificial intelligence, and cloud computing infrastructure, the team can analyze vast amounts of data to generate accurate and detailed flood predictions. This technology-driven approach enables real-time monitoring, rapid response, and enhanced preparedness for flood events. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

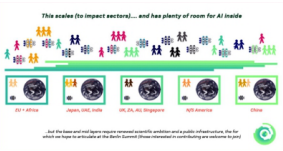
The economic benefits of the Google Flood Forecasting Team's activities are significant. By providing accurate flood predictions, governments, infrastructure developers, and insurance companies can make informed decisions to reduce economic losses caused by floods. Timely alerts and early warning systems also help minimize disruption to businesses, improve resource allocation for emergency response, and enhance overall flood resilience, leading to long-term economic stability and growth.

Environmental Benefits

Its' activities provide environmental benefits by promoting sustainable and resilient approaches to flood management. Accurate flood predictions enable better land use planning, ensuring that critical ecosystems and floodplain areas are protected. By minimizing the impacts of floods on the environment, the team contributes to biodiversity preservation, water resource management, and the overall sustainability of ecosystems.

Societal Benefits

Its' activities provide significant social community and societal benefits. By issuing timely and accurate flood warnings, the team helps communities and individuals prepare for and respond to flood events, reducing the risk to human life. Accessible and understandable flood forecasts empower communities, emergency responders, and individuals to make informed decisions and take proactive measures to protect themselves and their property. This leads to enhanced community resilience, reduced displacement, and improved disaster preparedness.



Environment and energy: NVIDIA Climate Simulation Research

Member Economy: The United States

Introduction

The NVIDIA Climate Simulation Research Team was initiated as part of NVIDIA Corporation's commitment to addressing climate change through technological advancements. While NVIDIA was founded in 1993, the specific climate simulation research team was established in 2015 to focus on leveraging high-performance computing and AI technologies to advance climate modeling and research. By enhancing climate models' accuracy and resolution, the team aims to provide policymakers, researchers, and communities with better insights into climate dynamics and enable evidence-based decision-making to address the challenges posed by climate change. The team consists of scientists, researchers, and engineers with expertise in climate science, computer modeling, and data analytics.

Activities in the BCG Economy Model

The NVIDIA Climate Simulation Research Team's main activities align with the BCG Economy Model by utilizing advanced technology to improve climate modeling and simulation capabilities. The team develops and optimizes climate models that incorporate high-resolution data, AI algorithms, and computational power provided by NVIDIA's GPUs. These models enable more accurate and detailed simulations of climate patterns, extreme weather events, and their potential impacts.

Technology Innovativeness

The NVIDIA Climate Simulation Research Team implements innovative measures and technologies in climate research and modeling. The team utilizes advanced GPU computing, AI algorithms, and machine learning techniques to accelerate climate simulations and enhance the fidelity of climate projections. By leveraging NVIDIA's cutting-edge technologies, the team pushes the boundaries of climate science and contributes to the development of more accurate and efficient climate models. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

The economic benefits are significant. Accurate and detailed climate simulations provide valuable information for a wide range of industries, including urban planning, infrastructure development, and insurance. By enabling more informed decision-making, these simulations help optimize resource allocation, reduce losses due to extreme weather events, and promote sustainable development practices.

Environmental Benefits

Its' activities provide significant environmental benefits. By improving climate models' accuracy, these simulations contribute to a better understanding of climate change impacts on ecosystems, biodiversity, and natural resources. This knowledge supports the development of effective conservation strategies, land-use planning, and sustainable resource management, fostering environmental stewardship and resilience.

Societal Benefits

The tam's activities provide social and societal benefits by enabling more effective climate risk assessment and disaster preparedness. Accurate climate simulations help communities and governments understand the potential impacts of climate change, supporting proactive measures to protect vulnerable populations, enhance infrastructure resilience, and improve public safety. By contributing to climate science advancements, the team facilitates global efforts to address climate change and protect the well-being of societies.



Environment and energy: Quantum Biotech Co., Ltd.

Member Economy: Thailand

Introduction

Quantum Biotech Co., Ltd. was launched in 2020. It was founded as a private startup company with a vision to revolutionize the biotechnology sector in Thailand through the application of quantum computing and advanced computational algorithms. It addresses the challenges in drug discovery and biotechnology research by leveraging the power of quantum computing and advanced computational algorithms. The company aimed to expedite the development of novel therapeutics, improve treatment outcomes, and contribute to the advancement of precision medicine in Thailand and beyond.

Activities in the BCG Economy Model

Its' main activities align with the BCG Economy Model by harnessing technology and innovation in the biotech industry. The company develops and utilizes quantum computing algorithms and computational modeling techniques to accelerate the drug discovery process, optimize molecular simulations, and enhance precision medicine approaches.

Technology Innovativeness

It implements highly innovative measures and technology in its approach. The utilization of quantum computing provides exponential computational power, allowing the company to model complex biological systems and accelerate drug discovery processes. The integration of advanced computational algorithms further enhances the accuracy and efficiency of molecular simulations and data analysis. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

It brings significant economic benefits through its technological advancements in the biotech sector. By streamlining the drug discovery process, the company reduces the time and cost associated with developing new therapies. This efficiency translates into potential cost savings for pharmaceutical companies, increased competitiveness, and economic growth for the biotech industry.

Environmental Benefits

Its' environmental benefits primarily lie in its contribution to more sustainable drug development practices. By optimizing molecular simulations and computational modeling, the company reduces the need for extensive laboratory experiments, minimizing resource consumption and waste generation associated with traditional drug discovery approaches.

Societal Benefits

It provides social community and societal benefits by advancing precision medicine and improving treatment outcomes. Through its innovative technology, the company aims to develop more effective therapies tailored to individual patients, ultimately enhancing healthcare and quality of life. Its' research findings and discoveries also contribute to the scientific knowledge base, benefiting the broader scientific community.

Biotechnology: Biotech Global Innovation Company

Member Economy: Thailand

Introduction: Biotech Global Innovation Company was initiated in 2017 and finally launched in 2019. It was founded as a private startup company with a mission to drive innovation and technological advancements in the biotechnology sector in Thailand. It addresses critical healthcare challenges and promote technological advancements in the biotechnology sector. The company aimed to develop innovative solutions that could improve diagnostics, treatment outcomes, and patient care.

Activities in the BCG Economy Model: Its' main activities align with the BCG Economy Model by leveraging technology and innovation in the biotech industry. The company focuses on developing novel biotechnological solutions, such as advanced diagnostics, gene therapies, and precision medicine approaches. Additionally, the company actively engages in research collaborations, knowledge-sharing, and technology transfer initiatives to foster the growth of the biotech ecosystem in Thailand.

Technology Innovativeness: It implements cutting-edge technologies and innovative measures in its approach. The company utilizes advanced molecular biology techniques, bioinformatics tools, and data analytics to drive research and development. This includes the use of artificial intelligence, machine learning algorithms, and high-throughput screening methods to accelerate the discovery and development of new biotechnological products and therapies. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits: It brings substantial economic benefits through its technological advancements in the biotech sector. By developing innovative biotechnological products and therapies, the company creates new market opportunities, attracts investments, and generates economic value. The growth of the biotech industry also stimulates job creation and contributes to the overall economic development of Thailand.

Environmental Benefits: Its' environmental benefits stem from its focus on sustainable biotechnological practices. The company emphasizes green bioprocesses, reducing waste generation, and minimizing environmental impacts associated with traditional biotechnological methods. By adopting eco-friendly approaches, such as utilizing renewable resources and optimizing production processes, the company contributes to a more sustainable and environmentally conscious biotech sector.

Societal Benefits: It provides social community and societal benefits through its innovative biotechnological solutions. By improving diagnostics and developing targeted therapies, the company enhances healthcare outcomes, leading to better patient care and quality of life. Additionally, the company's research efforts contribute to scientific knowledge and expertise, benefiting the broader scientific community and fostering scientific advancements.



Biotechnology: Genoplan

Member Economy: The Republic of Korea

Introduction

Genoplan was initiated in 2015 and finally launched in 2017. It was founded as a private company with a focus on providing personalized genetic testing and analysis services. It leverages advancements in genetics and technology to provide personalized healthcare solutions. The company aims to empower individuals to take control of their health and well-being by providing accessible and accurate genetic information.

Activities in the BCG Economy Model

Its' main activities align with the BCG Economy Model by offering personalized genetic testing and analysis services. The company utilizes advanced technology and algorithms to analyze an individual's genetic information and provide insights into their health, wellness, and disease risks. This empowers individuals to make informed decisions regarding their lifestyle, preventive healthcare, and personalized treatments.

Technology Innovativeness

It implements innovative measures and technology in its genetic testing and analysis services. The company utilizes next-generation sequencing techniques, bioinformatics algorithms, and data analytics to interpret and analyze genetic data. By leveraging cutting-edge technology, it enhances the accuracy, reliability, and accessibility of genetic information for individuals. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Its' services offer economic benefits by providing individuals with personalized insights into their health and disease risks. By understanding their genetic predispositions, individuals can make proactive choices regarding preventive healthcare, potentially reducing healthcare costs associated with managing chronic diseases. Additionally, the growth of the personalized genetics market contributes to job creation and economic growth in the biotechnology and healthcare sectors.

Environmental Benefits

Its' activities do not directly provide environmental benefits. However, by promoting preventive healthcare and personalized treatments, the company indirectly contributes to sustainable healthcare practices. Preventive healthcare reduces the burden on healthcare systems and minimizes the environmental impact associated with the treatment of chronic diseases.

Societal Benefits

It provides a social benefit to the community by empowering individuals to make informed decisions about their health and well-being. By offering personalized genetic testing and analysis, the company enables individuals to understand their genetic predispositions and take proactive measures to improve their health. This can lead to healthier lifestyles, disease prevention, and improved quality of life for individuals and their families.





Biotechnology: Spiber Inc.

Member Economy: Japan

Introduction

Spiber Inc. is a Japanese biotechnology company founded in 2007. The company was founded with the vision of developing sustainable and innovative biomaterials through biotechnology. Spiber aims to leverage biotechnology to create high-performance, eco-friendly materials that could replace conventional synthetic fibers, thereby reducing the impact of traditional materials and our reliance on non-renewable resources.

Activities in the BCG Economy Model

Spiber's main activities align with the BCG Economy Model through the development and production of sustainable biomaterials. The company utilizes advanced biotechnology techniques, such as recombinant DNA technology, to engineer and manufacture protein-based materials with applications for use in various industries, including fashion, automotive, and consumer goods.

Technology Innovativeness

Spiber implements innovative measures and cutting-edge biotechnology to achieve its goals. The company's technology involves genetically modifying microorganisms to produce structural proteins, which are then processed into fibers with exceptional diversity and a luxurious feel. This approach enables the production of sustainable materials that offer unique properties and performance characteristics, and can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

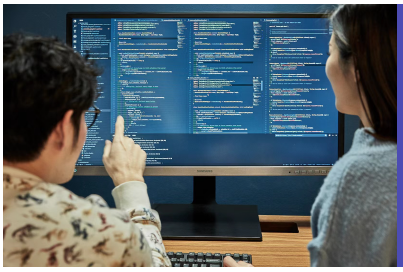
Spiber's technology-driven approach brings economic benefits by creating new market opportunities and driving industrial innovation. The company's biomaterials offer a positive impact on the environment compared to traditional materials, leading to increased demand and market competitiveness. This has the potential to generate economic growth, job creation, and revenue generation within the biotechnology sector.

Environmental Benefits

Spiber's biomaterials provide significant environmental benefits. By replacing conventional options such as animal and petrochemical-based materials with sustainable alternatives, the company helps reduce greenhouse gas emissions, minimize resource consumption, and mitigate environmental degradation. Additionally, the production process for Spiber's biomaterials has a lower carbon footprint compared to traditional manufacturing methods for some luxury fibers, such as cashmere fiber.

Societal Benefits

Spiber contributes to society by driving sustainable innovation and fostering a circular economy. The company's biomaterials offer more sustainable alternatives to traditional materials, promoting responsible consumption and production. Additionally, it actively engages with local communities, universities, and research institutions, fostering knowledge exchange and supporting talent development in the biotechnology field.



Technology: Skelter Labs

Member Economy: The Republic of Korea

Introduction

Skelter Labs was initiated in 2015 as a startup and officially launched its operations in 2017. The company focuses on developing AI and machine learning technologies to address various industry challenges. The company aimed to provide innovative and scalable Conversational AI solutions that enhance efficiency, productivity, and sustainability through the application of cutting-edge technologies.

Activities in the BCG Economy Model

Skelter Labs' main activities revolve around developing and implementing Conversational AI and machine learning technologies to improve efficiency and productivity in various industries. Their solutions encompass technologies like natural language processing, machine reading comprehension, Large Language Models, prompt engineering, as well as STT and TTS capabilities, among other advanced features. By providing advanced AI technologies, it enables businesses to optimize processes, make data-driven decisions, and transition towards a more resource-efficient and sustainable economy.

Technology Innovativeness

Skelter Labs implements innovative measures and technology by leveraging AI and ML algorithms to develop advanced Conversational AI solutions. The company continuously explores and applies the latest advancements in AI research to address industry-specific challenges and create novel applications that drive economic and environmental sustainability. Skelter Labs' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

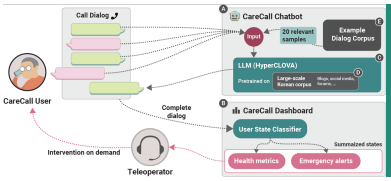
Skelter Labs' technology, including Conversational AI applications and LLM, brings tangible economic benefits to businesses. With their solution, there's a notable reduction in workload for customer service, leading to an estimated 15 to 20% decrease in their tasks. By leveraging their conversational AI solutions, companies can sidestep unnecessary R&D expenses, further enabling the optimization of processes, streamlining of operations, and facilitating data-driven decisions. They also contribute to the growth of the AI industry, creating job opportunities and economic development in the sector.

Environmental Benefits

Skelter Labs' technology offers indirect environmental advantages by assisting businesses in optimizing their operations and minimizing resource use. Aware of the significant energy required to develop new large generative AI models, Skelter Labs adopts a strategy of fine-tuning existing models. This approach is not only energy-efficient but also provides businesses with domain-specific generative AI models. By sidestepping the energy-intensive process of building large models from the ground up, Skelter Labs highlights their dedication to environmental protection and providing bespoke solutions to its clients.

Societal Benefits

Skelter Labs provides social and societal benefits by driving digital transformation and technological advancement in various sectors of different sizes and sectors. Their Conversational AI solutions empower businesses to innovate, improve customer experiences, and contribute to societal progress. By fostering technological growth, it indirectly creates job opportunities and promotes economic development within the community.



Technology: NAVER Cloud AI

Member Economy: The Republic of Korea

Introduction

Established in 2023 by NAVER Cloud, a subsidiary of NAVER Corporation – one of the Republic of Korea' s tech frontrunners - NAVER Cloud AI stands as a beacon of transformative AI technology. One of its' flagship commitments is to improve health and well-being for people of all ages via its Digital Healthcare Lab and AI Lab. By harnessing the power of AI solutions, the lab ventures into intricate R&D in healthcare AI, focusing on causality, explainability, voice-EMR, and healthcare applications of large language model.

IActivities in the BCG Economy Model

Its' main activities align with the BCG Economy Model by utilizing AI technology to improve health and well-being at all ages. The team develops AI-driven healthcare solutions, such as personalized health monitoring and intelligent healthcare management systems. These activities aim to enhance preventive care, diagnosis, and overall healthcare delivery, contributing to a healthier society.

Technology Innovativeness

The lab utilizes machine learning algorithms, deep learning models, and natural language processing techniques. A prime example is the CLOVA CareCall, an innovative solution designed to interact with and manage the health of elderly individuals living alone, collaborating with HyperCLOVA X team. This AI isn't just a voice on the other end; it adopts the responsibilities typically held by social workers or counselors in healthcare settings. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Harnessing the potential of AI, especially with solutions like CLOVA CareCall, not only revolutionizes healthcare but also carries substantial economic benefits. Through improved healthcare delivery and targeted interventions, there's a substantial reduction in costs. Further, CLOVA CareCall presents a robust solution for businesses and governments grappling with workforce shortages, as showcased during the pandemic. During the COVID-19 quarantines, this solution managed over 1.3 million calls, thus drastically cutting back on hospital visits and in-person consultations, making resource allocation more efficient. Moreover, the development, enhancement, and distribution of such AI tools create employment opportunities across both technology and healthcare sectors, subsequently spurring economic growth.

Environmental Benefits

Beyond the primary mission of health and well-being, there's an inherent environmental consideration in NAVER's activities. By focusing on preventive care and efficient interventions, as showcased by CLOVA CareCall's role in managing the health of the elderly remotely, there's a potential reduction in environmental footprint. Fewer physical visits mean lesser transportation-related emissions and decreased resource usage in healthcare facilities.

Societal Benefits

With AI solutions like CLOVA CareCall, there's a paradigm shift in how healthcare is perceived and accessed. The elderly, especially those living alone, benefit from personalized health monitoring and interaction, ensuring they aren't left in isolation, particularly during challenging times like pandemics. Such timely AI interventions facilitate proactive healthcare management, enhancing the overall quality of life across varied age groups.



Technology: Weixin Pay, Tencent

Member Economy: China

Introduction

Weixin Pay was initiated as a digital payment service by Weixin (parent company: Tencent Holdings Ltd.) in August 2013. Since then, it has gained significant popularity and has become one of the leading mobile payment providers in China. It was established to address the growing demand for convenient and secure payment solutions. By leveraging technology, the platform aimed to simplify financial transactions, reduce reliance on physical cash, and foster a digital economy. The motivation to contribute to environmental sustainability by promoting a green economy further drove the development and adoption of Weixin Pay.

Activities in the BCG Economy Model

Its' main activities revolve around providing digital payment solutions that facilitate transactions in an efficient and environmentally friendly manner. By offering cashless payment options through mobile devices, it promotes resource efficiency, reduces paper waste from traditional transactions, and supports the shift towards a greener economy.

Technology Innovativeness

It implements innovative measures and technologies to revolutionize the payment landscape. It utilizes advanced mobile payment technologies, encryption methods, and data security protocols to ensure safe and efficient transactions. The integration of QR code technology enables users to make payments conveniently through their mobile devices, reducing the need for physical cash and paper receipts. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

It has generated significant economic benefits for various stakeholders. It has facilitated efficient and secure transactions, promoting financial inclusion and boosting consumer spending. Merchants benefit from increased sales and reduced operational costs associated with cash handling. Additionally, it contributes to the growth of the digital economy, stimulating innovation and creating employment opportunities in related sectors.

Environmental Benefits

It provides substantial environmental benefits by promoting a paperless and resource-efficient payment ecosystem. By enabling digital transactions, it reduces paper waste from receipts and minimizes the carbon footprint associated with traditional payment methods. The widespread adoption of Weixin Pay contributes to the conservation of natural resources and supports the transition to a low-carbon economy.

Societal Benefits

It offers social benefits to the community by fostering financial inclusion and convenience. Its inclusive design accommodates users of various demographics and promotes financial inclusion by offering convenient and secure payment options to individuals who may have limited access to traditional banking services. Weixin Pay's platform also enables users to contribute to charitable causes, promoting social responsibility and community engagement.



Technology: Advanced Remanufacturing and Technology Centre (ARTC)

Member Economy: Singapore

Introduction

The ARTC was initiated in 2012 as a public-private partnership between the Agency for Science, Technology and Research (A*STAR), Nanyang Technological University (NTU), and industry partners. It was officially launched in 2014 to accelerate the adoption of advanced manufacturing technologies and drive sustainable remanufacturing practices. The stakeholders collaborate closely to drive research, technology development, and knowledge sharing in the field of advanced manufacturing and remanufacturing. The center aims to develop and deploy advanced manufacturing technologies and remanufacturing processes that would enable the transformation of industries towards a more circular and resource-efficient model.

Activities in the BCG Economy Model

ARTC's main activities align with the BCG Economy Model through its focus on advanced manufacturing technologies and sustainable remanufacturing practices. The center conducts R&D projects, technology demonstrations, and industry collaborations to develop innovative solutions that optimize resource efficiency, reduce waste, and extend product lifecycles.

Technology Innovativeness

ARTC implements innovative measures and technologies to achieve its objectives. The center focuses on emerging technologies such as additive manufacturing, robotics, artificial intelligence, and data analytics to optimize manufacturing processes, enhance product design, and enable remanufacturing capabilities. By adopting and developing cutting-edge technologies, ARTC drives innovation and promotes technology transfer to the industry. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

ARTC's activities bring economic benefits to the manufacturing sector and industry partners. By adopting advanced manufacturing technologies and sustainable remanufacturing practices, companies can enhance their competitiveness, improve operational efficiency, and reduce costs. ARTC's research and development efforts also foster the growth of new businesses and job opportunities in the manufacturing and technology sectors.

Environmental Benefits

ARTC's focus on sustainable remanufacturing practices contributes to environmental benefits by reducing resource consumption, minimizing waste generation, and lowering carbon emissions. Remanufacturing extends the lifecycle of products, reduces the need for raw materials, and diverts waste from landfills. Through its research and technology development, ARTC promotes environmental sustainability and supports the transition to a circular economy.

Societal Benefits

ARTC provides social benefits to the community by driving innovation and technological advancements in the manufacturing sector. The center's activities create opportunities for knowledge transfer, skills development, and job creation. By promoting sustainable manufacturing practices, ARTC contributes to a greener and more sustainable society, improving the quality of life for individuals and communities.



Technology: Hyperchain

Member Economy: China

Introduction

Hyperchain is a leading provider of enterprise blockchain solutions hailing from China, known for its remarkable strides in the realm of sustainable innovation. With a deep-rooted commitment to environmental betterment, Hyperchain has emerged as a frontrunner in developing cutting-edge solutions that not only meet the demands of today's tech landscape but also contribute significantly to carbon reduction.

Activities in the BCG Economy Model

Within the framework of the BCG Economy Model, Hyperchain has strategically aligned its endeavors to echo the principles of sustainability and resource optimization. Its initiatives span across various sectors, where the application of blockchain and decentralized technologies is seamlessly integrated to achieve more efficient and eco-friendly processes.

Technology Innovativeness

At the heart of Hyperchain's contribution lies its innovative application of blockchain to drive carbon reduction. By employing blockchain's inherent transparency and traceability, Hyperchain enables seamless monitoring of carbon emissions across supply chains, production processes, and transportation networks. This not only enhances accountability but also empowers stakeholders to identify areas for improvement with pinpoint accuracy.

Economic Benefits

Hyperchain's technology has enabled traditional manufacturing to transition to low-energy operations, delivering significant economic benefits. Enhanced supply chain visibility and optimized resource allocation have reduced costs and boosted efficiency. In just three months at China's largest decentralized dye production base, it converts 26k tons of hazardous waste to reusable resources, saving the industrial park over RMB89 million in costs.

Environmental Benefits

Hyperchain's technology plays a pivotal role in minimizing carbon emissions. It spearheads city-level transportation energy infrastructure projects across China, as well as provincial-level pollution reduction and carbon mitigation initiatives. It has already reached 23,189 enterprises in Zhejiang Province, effectively managing carbon emissions exceeding 200 million tons. The transparency offered by blockchain fosters a culture of accountability, encouraging responsible actions at every stage of production and distribution.

Societal Benefits

Beyond economic and environmental advantages, Hyperchain's technology extends its positive impact to society. Carbon footprint applications integrated with blockchain technology are designed to encourage societal citizens to embrace the concept of low-carbon living. Currently, over a million users have joined this low-carbon initiative. As industries adopt such innovations, they inherently promote public awareness and drive collective action toward carbon reduction and ecological preservation.



Supply Chain: TheLorry.com

Member Economy: Malaysia

Introduction

TheLorry.com was launched in Malaysia in 2014. It was founded as an online logistics platform to provide efficient and reliable transportation services. It primarily operates in Malaysia but has expanded its services to other economies in Southeast Asia. It offers logistics and transportation services within major cities and regions, catering to both local and cross-border deliveries. It addresses the inefficiencies and challenges in the traditional logistics industry. The company aims to utilize technology to simplify the booking process, enhance transparency, and optimize logistics operations.

Activities in the BCG Economy Model

Its' main activities align with the BCG Economy Model by leveraging technology to optimize logistics operations and promote resource efficiency. The company provides an online platform that enables customers to book various types of transportation services, including lorry rentals, house moves, and delivery services. By digitalizing and streamlining logistics processes, TheLorry.com contributes to a more efficient and sustainable supply chain.

Technology Innovativeness

TheLorry.com implements innovative technology measures to improve the logistics experience. The company's online platform utilizes advanced algorithms to match customer requirements with the most suitable logistics service providers, ensuring efficient resource allocation. Additionally, the platform incorporates real-time tracking, automated payment systems, and customer feedback mechanisms, enhancing transparency and customer satisfaction. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

Its' technology-driven approach brings significant economic benefits to the logistics industry and customers. By optimizing logistics processes and reducing inefficiencies, the company improves cost-effectiveness for businesses and individuals requiring transportation services. The platform also creates new job opportunities for logistics service providers and drives economic growth in the sector.

Environmental Benefits

It contributes to environmental sustainability by promoting optimized route planning and load consolidation, reducing empty trips, and minimizing fuel consumption. By maximizing resource efficiency, the company helps lower carbon emissions and reduces the environmental impact of logistics operations. These efforts contribute to a greener and more sustainable economy.

Societal Benefits

It provides social community and societal benefits by enhancing accessibility to reliable transportation services. The platform caters to individuals, small businesses, and large enterprises, offering an inclusive solution for their logistics needs. It also emphasizes transparency, fairness, and equal opportunities for logistics partners, promoting a level playing field. TheLorry.com also supports community engagement by collaborating with charitable organizations, contributing to disaster relief efforts, and participating in social impact initiatives.



Supply Chain: GS1 Hong Kong

Member Economy: Hong Kong, China

Introduction

Founded in 1989, GS1 Hong Kong serves as the local chapter of GS1, a non-profit organization headquartered in Belgium. It develops and drives global adoption of supply chain standards, including barcodes standards. GS1 Hong Kong's mission is to empower business to grow and to improve efficiency, safety, authenticity and sustainability across multiple sectors and facilitate commerce connectivity, through their platforms, solutions and services.

Activities in the BCG Economy Model

GS1 Hong Kong, along with its global direction, is prominently engaged in elevating traditional linear 1D barcodes to QR codes powered by GS1 (2D barcodes), thereby augmenting supply chain efficiency and sustainability. This innovative technology is not only accommodating more data than the conventional 1D barcodes, it enables comprehensive end-to-end visibility and traceability of products throughout the supply chain, it also facilitates efficient inventory management, can support product authentication, and real-time data sharing. This resonates strongly with the Model's emphasis on leveraging technology to foster sustainable economic progress.

Technology Innovativeness

The transition to QR codes for identification on item/product level represents a pioneering step towards enhancing efficiency. This technology enables swift and accurate data capture, and frictionless real-time information sharing among stakeholders, including manufacturers, retailers, and consumers. It has catalyzed a transformation in conventional supply chain practices, setting the stage for next level business efficiencies, consumer engagement and point-of-sale. By 2027, the technology is poised to enable QR codes at readable at retail points-of-sale globally.

Economic Benefits

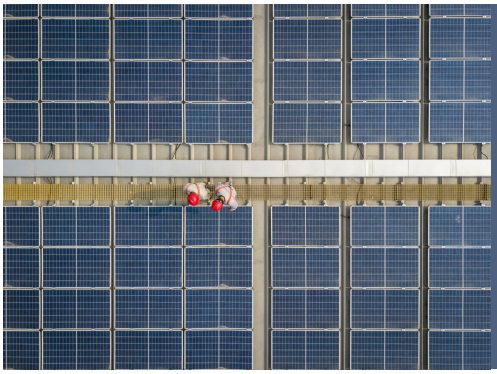
The implementation of QR code brings significant economic benefits to supply chain stakeholders. It improves operational efficiency by reducing manual data entry, streamlining inventory management, and minimizing errors and delays. Further, it can help consumers obtain product information online or even discount offerings. The technology enables better demand forecasting, optimized logistics planning, and improved customer satisfaction. These efficiencies contribute to cost savings, increased productivity, and overall supply chain performance.

Environmental Benefits

The QR code for identification on product level provides environmental benefits by reducing waste and promoting sustainable practices in the supply chain. It enables accurate tracking and tracing of products, facilitating efficient and effective product recalls and reducing food waste. Further, it supports regulators provide more product sustainability information to consumers; e.g. it aligns with the European Union's Circular Economy Action Plan, potentially supporting the Digital Product Passport requirement. It is supporting ECO compliance requirements in France and Italy. This entails offering transparent and accessible information regarding the environmental sustainability attributes of products.

Societal Benefits

The QR code enhances supply chain transparency and product authenticity, ensuring consumer safety and trust. It enables consumers to access detailed product information, such as origin, product specifications like nutrition value, and certifications, fostering informed purchasing decisions. Additionally, the technology supports initiatives related to product recalls, food safety, and ethical sourcing, contributing to a safer and more socially responsible supply chain.



Supply Chain: JD.com

Member Economy: China

Introduction

JD.com, also known as Jingdong, is a leading Chinese e-commerce and technology company headquartered in Beijing. Renowned for its innovative approach to technology integration, JD.com has been a pivotal player in advancing the Bio-Circular-Green (BCG) Economy Model through its multifaceted initiatives.

Activities in the BCG Economy Model

JD.com has undertaken a series of initiatives that align seamlessly with the principles of the BCG Economy Model. The company has actively promoted the adoption of sustainable and eco-friendly practices across its business operations. Key undertakings include initiatives to reduce waste, optimizing logistics and supply chains, and integrating green technologies into its delivery systems.

Technology Innovativeness

JD.com' s commitment to innovation is exemplified by its cutting-edge use of technology. From leveraging AI and big data to optimizing transportation routes, reducing carbon emissions, and utilizing blockchain technology to ensure product traceability and authenticity, JD.com has showcased its pioneering spirit in transforming conventional business models into more sustainable alternatives.

Economic Benefits

JD.com's adoption of technology within the framework of the BCG Economy Model has yielded significant economic advantages. The company' s streamlined supply chain management and efficient logistics systems have not only reduced operational costs but have also optimized resource utilization. By embracing green technology, JD.com has tapped into new revenue streams while fostering market differentiation.

Environmental Benefits

Through its innovative strategies, JD.com has made substantial contributions to environmental conservation. By implementing technologies that enhance resource efficiency and reduce waste, the company has minimized its carbon footprint. Notably, its shift to electric vehicle delivery has substantially reduced greenhouse gas emissions, contributing to a greener ecosystem.

Societal Benefits

The societal implications of JD.com's technology-driven initiatives are profound. By championing product transparency and authenticity through blockchain technology, the company has empowered consumers to make more informed choices. Additionally, its commitment to reducing plastic waste and supporting sustainable sourcing resonates with consumers who value environmentally responsible brands.



Tourism: Beijing Shougang Park

Member Economy: China

Introduction

Beijing Shougang Park was initiated in 2015 and officially launched in 2017. It represents a collaborative effort between the government, private sector, and local community to transform an abandoned factory into a dynamic travel spot. The key motivations for the establishment of Beijing Shougang Park were to revitalize the abandoned factory site, promote cultural and creative industries, attract tourists, and generate economic opportunities for the local community. The park aimed to preserve the historical and industrial heritage of the site while creating a platform for artistic expression, cultural exchange, and community engagement.

Activities in the BCG Economy Model

It engages in activities that align with the BCG Economy Model by transforming an abandoned factory into a vibrant travel spot. The park offers a range of cultural and creative experiences, including art exhibitions, performances, workshops, cultural heritage preservation, and interactive installations. Technology is integrated into the park's activities to enhance visitor experiences and provide innovative forms of engagement.

Technology Innovativeness

It implements innovative measures and technologies to enhance visitor experiences and create an immersive environment. The park utilizes augmented reality, interactive displays, and digital installations to provide engaging and educational experiences for visitors. Additionally, the park utilizes online platforms for ticketing, information dissemination, and community participation. Its' innovative approach can be adapted and transferred to other economies seeking to achieve the BCG economy model.

Economic Benefits

The transformation of the abandoned factory has generated significant economic benefits. The park attracts tourists, both local and abroad, driving revenue through ticket sales, retail businesses, food and beverage establishments, and cultural events. The park has also created employment opportunities for local residents, contributing to economic growth in the surrounding community. It has stimulated the growth of the local creative economy by providing a platform for artists, designers, and entrepreneurs to showcase and sell their products.

Environmental Benefits

It provides environmental benefits by repurposing the abandoned factory and minimizing the need for new construction. The park's redevelopment preserves existing infrastructure, reducing the ecological footprint associated with new developments. The park also incorporates sustainable practices, such as energy-efficient lighting, waste management systems, and the use of eco-friendly materials where possible.

Societal Benefits

It provides social and societal benefits to the community. The park serves as a platform for cultural exchange, nurturing local talent, and promoting artistic expression. It offers spaces for community gatherings, educational programs, and cultural events, fostering social cohesion and community pride. The park actively engages with local residents and encourages their participation in shaping the park's development and programming. Further, efforts were made to provide accessibility for people with disabilities, and initiatives are in place to engage underrepresented groups, promoting social inclusivity.



7

SEMINAR SUMMARY REPORT

7.1 Seminar Description



Topic: Seminar on APEC Bio-Circular-Green (BCG) Startups Regional Program on Sustainable Growth

Date: 11-13 September 2023

Location: Guangxi Wharton International Hotel, Nanning, Guangxi Zhuang Autonomous Region, People's Republic of China

Purpose: The seminar aimed to explore innovative solutions, share best practices, discuss policies, and foster collaboration in addressing sustainable growth within the APEC region through the BCG Economy Model. It brought together experts, entrepreneurs, government officials, academia, and stakeholders to discuss policies, initiatives, and technologies to promote the BCG Model, with a focal spotlight on empowering startups.

In particular, the event emphasized on empowering startups and bridging the policy gap through capacity building. Over three days, participants engaged in seven keynote speeches, two policy dialogues, four capacity-building discussions (including one focused on vulnerable groups), and a special project roadshow showcasing eight startups championing the BCG Economy Model with technological innovation.

Speakers: The seminar featured a diverse range of speakers from public and private sectors, including entrepreneurs, policymakers, academia, and international organizations. These experts shared their insights and experiences, highlighting the role of innovation and collaboration in achieving the BCG economy.

Notably, the event hosted close to 50 experts and participants representing 14 APEC member economies, namely Australia; Canada; Chile; China; Hong Kong, China; Malaysia; Mexico; Papua New Guinea; Peru; the Philippines; Singapore; Thailand; the United States; Viet Nam. Additionally, the seminar welcomed participants from non-APEC economies, such as the United Kingdom, Portugal, and Cambodia, who contributed valuable perspectives as dedicated professionals affiliated with international organizations, such as the United Nations Commission on Science and Technology for Development and the Organization for Economic Cooperation and Development.

Target Audience: This exclusive seminar was designed as a closed-door event, meticulously curated to engage a select gathering of approximately 50 distinguished participants. Within this select assembly, the event welcomed policymakers, esteemed government officials, visionary entrepreneurs, accomplished researchers, and vested stakeholders. Each participant played a pivotal role in advancing the BCG model and how technology can contribute to the model and sustainable growth in APEC. Further details, including the comprehensive agenda, are available in the annexed documents.

7.2 Summary of Presentation



The seminar commenced with welcoming remarks and introduction to the advancements in the BCG Economy Model by officials from China and Thailand. The United Nations Commission on Science and Technology for Development then presented a global perspective on sustainability, emphasizing the critical need for more investments and innovative approaches to achieve the United Nations Sustainable Development Goals (UNSDGs).

Policymakers from various APEC member economies and other regions discussed their strategies for promoting sustainability, especially using the BCG Economy Model as a framework. China presented its forward-thinking initiatives and strategies to combat climate change and champion sustainability, underscoring its ambitious goals of carbon neutrality by 2060 and substantial carbon reduction by 2030. Thailand, another key host of the event, shared insights into its implementation of the BCG Economy Model. Their approach highlighted the significance of synergies, evidence-based innovations, and region-specific solutions to realize the objectives of the model.

Further, an OECD senior economist accentuated the immediacy required in adopting ambitious climate policies and the indispensable role of innovation in tackling climate change challenges. A scholar from the Chinese Academy of Social Sciences reinforced China's unwavering commitment to carbon neutrality and detailed its comprehensive strategies against climate change. Concluding the seminar, JD Logistics, a prominent Chinese e-commerce logistics firm, showcased its holistic strategy geared towards carbon emission reduction, emphasizing its steadfast dedication to sustainability and groundbreaking initiatives.

7.3 Summary of Discussion



Discussions during the seminar revolved around key themes such as innovation, inclusivity, and international collaboration. Participants engaged in lively debates on how these themes could be integrated into the BCG Economy Model.

Speakers from the private sector showcased groundbreaking innovations spanning renewable energy, robotics, AI, blockchain, creative financing solutions, and biomass. These solutions aimed to tackle poverty, reduce emissions, manage waste, and promote eco-agriculture and sustainable transportation. Such presentations underscored the pivotal role of entrepreneurship and cutting-edge technology in driving sustainable development with the model.

Inclusivity stood out as a paramount theme. There was a unanimous call for co-creating policies tailored to the unique needs of vulnerable groups, such as women, residents of rural or isolated regions, individuals with disabilities, and indigenous communities. Inclusivity involves ensuring equal access to innovative technologies and opportunities for participation in the BCG Economy.

The role of international collaboration was a recurring point of discussion. Participants recognized that addressing global sustainability challenges required collective action. Knowledge sharing, technology transfer, and collaborative research were highlighted as essential components of international cooperation.

7.4 Summary of Policy Intervention Developed in the Seminar

The seminar underscored the need for robust policies to foster sustainable economies and combat climate change. Five key interventions highlighted include:

- **Public-Private Partnerships (PPPs):** Recognized as crucial for bolstering the BCG Economy Model, PPPs aim to ensure mutual benefits for communities through seamless collaboration between the public and private sectors.

- **Targeted Support and Infrastructure Development:** A focused approach to endorsing specific technologies, particularly those tied to infrastructural advancements like green transportation, was underscored.

- **Championing R&D and Cultivating Innovation Ecosystem:** The importance of ongoing research and the development of innovative technologies as cornerstones of the model was accentuated by various speakers. Further, a unified call was made for both public and private sectors to nurture an innovation ecosystem conducive for startups, MSMEs, and other entities, propelling them to devise pioneering solutions.

- **Prioritizing Education and Awareness:** The seminar shed light on the essentiality of educating the public about sustainable development. Initiatives centered on engaging the youth were spotlighted. Moreover, it was highlighted that both policies and corporate strategies must encompass critical facets such as green evolution, carbon mitigation, resilience, and inclusivity.

- **Setting Measurable Standards:** It was proposed that both governmental bodies and businesses integrate specific metrics and benchmarks of the model in their policies, enabling consistent evaluation of their efficiency.

7.5 List of Policy Recommendation

The seminar generated the following eight policy recommendations:

- **Leveraging PPPs:** These partnerships can synergize the capabilities of both sectors, effectively addressing environmental and societal issues.

- **Supportive Framework:** Governments ought to craft policies that propel technological convergence with the BCG model's principles.

- **Financial Catalysts:** Governments are encouraged to prioritize backing startups centered around sustainability by introducing incentives and resources to accelerate their development. Further, governments shall extend financial inducements to private entities investing in the BCG Economy. For example, green sector entrepreneurs should be beneficiaries of augmented resources and support.

- **Championing Inclusivity:** It is paramount that governmental strategies emphasize inclusivity, catering specifically to the requisites of marginalized communities.

- **Upholding Global Standards:** It is endeavor to conceive and synchronize global benchmarks and validations for technologies and methodologies in

line with the BCG Economy. Advocacy for businesses' alignment with such standards can facilitate their integration into international value chains.

- **Boost R&D Allocations:** It calls for support from the public and private sectors on research and innovation, with a particular emphasis on eco-friendly technologies.

- **Collaborative Endeavors and Knowledge Dissemination:** We shall foster collaborative initiatives among startups, businesses, academic institutions, and governmental agencies. Our future strategies shall include revising trade policies, encouraging international partnerships, launching skill development programs, strengthening regional collaborations, and enhancing infrastructure. By promoting international dialogue, startups can benefit from and integrate global best practices.

- **Education and Consciousness Raising:** Capacity building and skill development are key to realizing green initiatives and technologies. Public and private sectors shall collaborate to provide continued education to enhance capacity and shills.

7.6 Conclusion

The Seminar on APEC Bio-Circular-Green (BCG) Startups Regional Program on Sustainable Growth highlighted the region's commitment to sustainability with the model.

A set of policy recommendations emerged, innovation, inclusivity, and international collaboration were identified as essential elements in achieving sustainability goals in APEC. Policymakers, entrepreneurs, and international organizations play pivotal roles in driving the goals forward. By embracing innovation and collaboration while ensuring inclusivity, APEC member economies are poised to lead the way in shaping a more sustainable future.



8 POLICY RECOMMENDATIONS

Based on the study's findings, nine policy recommendations were identified to accelerate the development of technologies aligned with the BCG Economy Model and promote their adoption by startups and other businesses across APEC economies.

By providing a comprehensive framework for policy action, these recommendations seek to foster an enabling environment that supports startups and other businesses in their technological advancements and enables businesses to effectively apply sustainable practices.

- **Establish Supportive Policy Frameworks:** APEC member economies should develop comprehensive and supportive policy frameworks that incentivize and encourage startups to develop technologies aligned with the model. These frameworks should include funding mechanisms, tax incentives, and regulatory support to facilitate the growth of startups and promote innovation in sustainable technologies.

- **Encourage Public-Private Partnerships:** Governments should foster strong partnerships between the public and private sectors to drive technology development and adoption for the model. Public-private partnerships can facilitate the sharing of resources, expertise, and risk, while also promoting technology transfer and commercialization.

- **Foster Collaboration and Knowledge Sharing:** APEC member economies should promote collaboration and knowledge sharing among startups, businesses, research institutions, and government agencies. This can be achieved through the establishment of platforms, such as innovation hubs, joint research projects, incubators, and technology transfer networks, where stakeholders can exchange ideas, share best practices, and collaborate on technology development and application.

- **Enhance Access to Financing:** Access to financing is crucial for startups and businesses to develop and deploy technologies that support the model. Governments should establish funding mechanisms, such as venture capital funds, grants, and loans, specifically targeted at supporting startups and businesses in the BCG sector. Additionally, financial institutions should be encouraged to provide tailored financial products and services to meet the unique needs of BCG-related enterprises.

- **Monitor and Evaluate Progress with Quantitative Methods:** APEC economies should establish monitoring and quantitative evaluation mechanisms to assess the progress and impact of technology adoption in achieving the model. Regular monitoring and quantitative evaluation methods will enable policymakers to identify barriers, measure the effectiveness of policies and initiatives, and make necessary adjustments to ensure continuous improvement.

- **Foster Skills Development and Capacity Building:** Governments should prioritize skills development and capacity building initiatives to ensure a skilled workforce capable of driving technology adoption and innovation in the BCG sector. This can be achieved through vocational training programs, educational partnerships with industry, and the inclusion of sustainability-focused curricula in educational institutions.

- **Facilitate Global Standards and Certification:** APEC economies should work together to develop and harmonize standards and certification systems for technologies and practices that support the BCG Economy Model. Standardization and certification will facilitate the adoption of technologies, promote interoperability, and ensure consistency in sustainability practices across different economies.

- **Strengthen Intellectual Property Rights Protection:** APEC economies should strengthen intellectual property rights protection to incentivize innovation and safeguard the rights of technology developers. Robust intellectual property regimes will encourage startups and businesses to invest in research and development, knowing that their innovations will be protected and rewarded.

- **Enhance Public Awareness and Education:** Governments should undertake public awareness campaigns to educate the public about the importance of the model and the role of technology in achieving sustainable economic development. Promoting a greater understanding of the benefits of the model can generate support and participation from businesses, consumers, and the wider community.



9 CONCLUSIONS

The research unequivocally underscores the pivotal role of technology in advancing the BCG Economy Model across APEC economies. Technology stands as a cornerstone, infusing innovation into resource management, manufacturing processes, and societal engagement. By optimizing resource utilization through digital systems, enabling circular economies through data-driven insights, and driving green initiatives with cutting-edge solutions, technology is reshaping industries across APEC economies.

The transformative potential of technology resonates across sectors, reinforcing its status as a catalyst for sustainable growth with the economic, environmental, and societal benefits:

- Economy Benefit: The economic benefits derived from technology integration are tangible and far-reaching. Our findings illustrate that sectors such as ICT industries, green hydrogen, bioethanol, and solar PV have experienced significant economic development. These benefits manifest as increased income, job creation, innovation, and enhanced productivity. The synergy between technology and economic growth signifies a promising path toward enhanced prosperity and economic resilience for APEC economies.

- Environmental Benefit: The environmental benefits of technology integration are evident in the shift towards sustainable practices. From optimizing energy consumption in manufacturing to smart agricultural practices that minimize water usage, technology is a driving force behind sustainable production and consumption patterns. This shift not only reduces carbon emissions and resource waste but also aligns with global initiatives promoting ecological sustainability.

- Societal Benefit: Technology bridges societal gaps and enhances access to critical services and opportunities. Digital platforms and connectivity have emerged as powerful tools, enhancing access to education, healthcare, and services. This inclusivity fosters informed decision-making and empowers vulnerable groups. Furthermore, technology plays a pivotal role in supporting initiatives related to product recalls, food safety, and ethical sourcing, contributing to a safer and more socially responsible supply chain.

The research identified and showcased diversified best practices across various sectors and technologies. From agriculture to technology, manufacturing to services, these best practices demonstrate that the BCG Economy Model is adaptable and applicable across a wide range of industries. Blockchain, IoT and data analytics, AI and image recognition, renewable energy, carbon capture, and robotics and automation have emerged as transformative technologies with the potential to drive sustainable growth.

The replicability and transferability of these best practices to other APEC economies are critical. These case studies provide a blueprint for APEC economies looking to integrate the BCG Economy Model. By sharing knowledge and insights, fostering collaboration, and harmonizing standards, APEC economies can collectively accelerate the adoption of these best practices.

The research culminated in a set of comprehensive policy recommendations aimed at empowering the BCG Economy Model. These recommendations encompass policy measures, technological advancements, capacity-building initiatives, and collaborative efforts among APEC member economies. By implementing these recommendations, APEC economies can foster sustainable and inclusive economic growth, promote technological innovation, and address pressing environmental challenges.

It is important to acknowledge the limitations of our research. While the report made significant strides in identifying and showcasing best practices, there may be undiscovered innovations and technologies that could further enhance the BCG Economy Model. Additionally, the research was based on the

available data and information up to a certain point in time, and the ever-evolving nature of technology means that new developments may have emerged since then.

Looking ahead, the research team is committed to continually monitor and document advancements in technology that empower the BCG Economy Model. They will seek to address the limitations by engaging in ongoing research and collaboration with APEC economies and stakeholders. Furthermore, they will organize more workshops, seminars, and capacity building events to facilitate the exchange of insights and promote the adoption of best practices. Together, we will work towards a future where technology continues to drive sustainable economic growth, environmental stewardship, and societal well-being across APEC economies and the global community.

Appendix: Seminar Agenda

Time	Topic	Speaker
11 September		
09:30 – 09:35	Introduction	Jieni Guo (China) Secretary General, Beijing International Exchange Association
09:35 – 09:50	Welcome Remarks	Rongfang Wang (China) Counselor (DG Level), International Cooperation Department, Ministry of Science and Technology of China
		Pasit Lorterapong (Thailand) Deputy Secretary-General, Ministry of Higher Education, Science, Technology and Innovation of Thailand
09:50 -10:45	Keynote Speeches Technology Revitalizing the Global Economy	Ana Cristina Amoroso das Neves (Portugal) Chair, The United Nations Commission on Science and Technology for Development
	Introduction of BCG Economic Model in Thailand	Sukit Limpijumnong (Thailand) President of the National Science and Technology Development Agency of Thailand Executive Vice Chairman of the Eastern Innovation Economic Corridor Vice Chairman of the Alliance of International Science Organizations for the Belt and Road Initiative
	A Few Thoughts on Carbon Neutrality	Xiangwan Du (China) Academician and Vice President of the Chinese Academy of Engineering Deputy Director of the National Energy Advisory Expert Committee
10:45 – 11:00	Tea Break	
11:00 – 11:45	Policy Panel Discussion: Technology Empowering the BCG Economic Model	Sylwyn Critica Calizo Jr. (The Philippines) Researcher, Policy Support Unit, APEC Secretariat
		Krithpaka Boonfueng (Thailand) Executive Director, National Innovation Agency of Thailand

		Zhifeng Wang (China) Executive Director, Tencent Financial Research Institute
		Dengyu Pan (China) Managing Director, Shenzhen Gaodeng Equipment Co., Ltd.
		Moderator: Walairatchata Mokkhavesa (Thailand) Senior Innovation Strategist, National Innovation Agency of Thailand
11:45 – 12:00	Release on the Best Case Study Report	Sam Han (Hong Kong, China) Co-founder, Partner and Director, Union Communications Hong Kong Limited
14:00 – 15:15	Capacity Building Discussion: Biology Economic Model	Enrique De Zamacona Meza (Mexico) Director, Biocluster Nuevo León, Mexico
		Dato' Kin Mun Leong (Malaysia) President, Malaysia Biomass Industries Confederation
		Arthur Nichols Aguilar (The Philippines) President, Biopower Group of Companies, The Philippines
		Moderator: Dong Guo (China) Deputy Division Director, China Science and Technology Exchange Center
15:15 – 16:15	Capacity Building Discussion: Circular Economic Model	Hemant Eknath Chaudhary (Australia) Founder & Managing Director, Circular Economy Alliance Australia & Circular 360
		Eng Yew Yeoh (Singapore) Director, BV RISE Regional Sustainability and Energy Transition, Bureau Veritas Group, Singapore
		Ratha Serei Chan (Cambodia) Deputy Chief of Operation Officer, Soma Group, Cambodia
		Jiyong Ding (China) General Manager, Jiangsu Weichuangjing Intelligent Technology Co., Ltd., China
		Moderator: Pasupha Chinvarasopak (Thailand) Minister Counsellor for Science, Royal Thailand Embassy in Beijing

16:30 – 16:45	Tea Break	
16:45 – 17:45	Capacity Building Discussion: Green Economic Model	María Fernanda Aguirre (Chile) Executive Director of Chile Green Building Council CEO of Chilean Corporation for Sustainable Development in Construction
		Ruiqi Wei (China) Assistant Professor, Emlyon Business School, France
		Wei Li (China) Founder & CEO, Hangzhou Hyperchain Technology Co., Ltd.
		Moderator: Chaiyatorn Limapornvanich (Thailand) Department Director (Innovation Strategy), National Innovation Agency of Thailand
17:45 – 18:00	Wrap up	Chui-Fung Loke (Malaysia) Vice President, Research & Development and Commercialization, Tunku Abdul Rahman University of Management and Technology, Malaysia
12 September		
09:30 – 09:35	Introduction	Walairatchata Mokkhavesa (Thailand) Senior Innovation Strategist, National Innovation Agency of Thailand
09:35 – 10:55	Keynote Speeches Policies for Low Carbon Innovation	Mario Cervantes (The United States) Senior Economist, Science and Technology Policy Division/CSTP, OECD
	China's Determination and Challenges to Achieve Carbon Neutrality	Ying Chen (China) Researcher and Deputy Director, Research Center for Sustainable Development, Chinese Academy of Social Sciences
	Public-Private Partnership on Promoting Circular Economy	Hemant Eknath Chaudhary (Australia) Founder & Managing Director, Circular Economy Alliance Australia & Circular 360
	Digital Technology Driven Supply Chain Net Zero Target	Christiana Wang (China) Low Carbon Product Expert, JD Logistics

10:55 – 11:10	Tea Break	
11:10 – 12:00	Capacity Building Discussion: BCG Model for Vulnerable Groups	Ha Thanh Thai (Viet Nam) Senior Lecturer, Faculty of Business Administration, Foreign Trade University, Viet Nam
		Silvana Baldovino (Peru) Director, Biodiversity and Indigenous Peoples Program, Sociedad Peruana de Derecho Ambiental (Peruvian Society for Environmental Law), Peru
		Weiqin Xie (China) Director, vivo AI Solution Center
		Moderator: Sam Han (Hong Kong, China) Co-founder, Partner and Director, Union Communications Hong Kong Limited
14:00 – 15:00	Policy Panel Discussion: Supporting Policies for Sustainable Growth of Start-ups in APEC	Rosibel Ochoa (The United States) Associate Vice Chancellor Technology Partnerships, University of California, Riverside, The United States
		Nicole Troster (Canada) Founder and Entrepreneurship Manager for the ELLA Accelerator, York University, Canada
		Sansanee Huabsomboon (Thailand) Director, Business Innovation Center, National Science and Technology Development Agency of Thailand
		Yuting He (China) Director, Vivo Miracle Biotechnology Limited
		Moderator: Vera Liu (China) International Project Manager, Beijing International Exchange Association
15:00 – 15:20	Tea Break	
15:20 – 17:00	BCG Startups/Projects Roadshow	Alejandra Cuba Canales (Peru) Founder & CEO, Caopack and Bikhuna Startups, Bikhuna Peruvian Company S.A.C., Peru
		Blair Guo (China) CEO and Founder, Shenzhen Feibai Technology Co., Ltd., China
		Ezekiel Dujambi (Papua New Guinea) Founder & CEO, LitFuel Biomass Pellet Manufacturing, Papua New Guinea

		Min Min Leow (Malaysia) Managing Director, Lipidgroup Sdn. Bhd., Malaysia
		Jian Zhu (China) CEO, Yizheng Haifeng Industry and Trade Co., Ltd., China
		Ina Quadra Guillermo (The Philippines) Senior Vice President, Biopower Group of Companies, The Philippines
		Karsidete Teeranitayatarn (Thailand) CEO and Founder, Morena Solutions CO., LTD., Thailand
		Zhipeng Dong (Hong Kong, China) COO, SOTA Robotics (HK) Limited
		Moderator: Carly Stevens (Australia) Counsellor (Economic), Australian Embassy in Beijing, China
17:00 – 17:15	Wrap up	Nicole Troster (Canada) Founder and Entrepreneurship Manager for the ELLA Accelerator, York University, Canada
13 September		
09:30 – 11:00	Visiting Guangxi Botanical Garden of Medicinal Plants	
15:00 – 17:00	Visiting JD's Asia No.1 Logistics Park in Naning	

References

Andres, E. A. S., Vasquez, G. N., & Karr, J. (2022). *Putrajaya Vision 2040, COVID-19 and Information Disorder. APEC.* https://www.apec.org/docs/default-source/publications/2022/10/putrajaya-vision-2040-covid-19-and-information-disorder/222_psu_putrajaya-vision-2040-covid-19-and-information-disorder.pdf?sfvrsn=78fdca72_2

APEC. (2021). *Aotearoa Plan of Action.* https://aotearoaplanofaction.apec.org/strong-balanced-secure-sustainable-and-inclusive-growth.html

APEC. (2022a, November 19). *2022 Leaders' Declaration.* https://www.apec.org/meeting-papers/leaders-declarations/2022/2022-leaders-declaration

APEC. (2022b). *Bangkok Goals on Bio-Circular-Green (BCG) Economy.* https://www.apec.org/meeting-papers/leaders-declarations/2022/2022-leaders-declaration/bangkok-goals-on-bio-circular-green-(bcg)-economy

ASEAN Briefing. (2022, November 24). *Thailand: New Incentives for Investor Retention, Relocation, High-Tech, and Green Industries.* ASEAN Business News. https://www.aseanbriefing.com/news/thailand-new-incentives-for-investor-retention-relocation-high-tech-and-green-industries/

Asian Development Bank. (2012). *Policies and Practices for Low-Carbon Green Growth in Asia: Highlights.* https://www.adb.org/sites/default/files/publication/29767/policies-green-growth-asia-highlights.pdf

Asian Development Bank. (2022). *Water in Asia and the Pacific.* https://www.adb.org/what-we-do/topics/water

Biotechnology Innovation Organization. (2021). *Biotech Sector Thrives, Generating Nearly $3 Trillion Economic Impact - New Report Shows.* https://www.bio.org/press-release/biotech-sector-thrives-generating-nearly-3-trillion-economic-impact-new-report-shows

Calizo Jr., S. (2022). *Charting New pathways for APEC: A Sustainable Future Inspired by the Bio-Circular-Green (BCG) Economy.* APEC. https://www.apec.org/docs/default-source/publications/2022/10/charting-new-pathways-for-apec/222_psu_charting-new-pathways-for-apec.pdf?sfvrsn=cbac242_2

Challe-Campiz, T. (2022). *Chile Adopts New Climate Change Framework Law: A Paradigm Shift.* Climate Law Blog. https://blogs.law.columbia.edu/climatechange/2022/06/22/

Chauhan, C., Parida, V., & Dhir, A. (2022). Linking circular economy and digitalisation technologies: A systematic literature review of past achievements and future promises. *Technological Forecasting and Social Change, 177, 121508.*

Chile, Ministry of the Environment (2021). *Roadmap for a Circular Chile by 2040.* https://economiacircular.mma.gob.cl/wp-content/uploads/2022/01/HOJA-DE-RUTA-PARA-UN-CHILECIRCULAR-AL-2040-EN.pdf

China Council for International Cooperation on Environment and Development (CCICED) Secretariat. (2023). Major Green Technology Innovation and Implementation Mechanism. *In: Green Recovery with Resilience and High Quality Development.* Springer, Singapore.

Cho, R. (2019, June 20). How Climate Change Impacts the Economy. Columbia Climate School, State of the Planet. https://news.climate.columbia.edu/2019/06/20/climate-change-economy-impacts/

CNIS. (2023, February 6). 工作动态 | APEC“节水标准最佳实践分享及效益评估研讨会”召开 . Weixin Official Accounts Platform. https://mp.weixin.qq.com/s/YYDRRxCmKzOnr9d71xDA1A

D’Amato, D., & Korhonen, J. (2021). Integrating the green economy, circular economy and bioeconomy in a strategic sustainability framework. *Ecological Economics, 188, 107143.*

Ekins, P., Domenech, T., Drummond, P., Bleischwitz, R., Hughes, N., & Lotti, L. (2019). *Managing Environmental and Energy Transitions for Regions and Cities How And Where Background Information.* OECD. https://www.oecd.org/cfe/regionaldevelopment/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf

Elgenraam, M. (2022). *Understanding the Bio-Circular-Green (BCG) Economy Model.* APEC. https://www.apec.org/docs/default-source/publications/2022/8/understanding-the-bio-circular-green-(bcg)-economy-model/222_sce_understanding-the-bio-circular-green-economy-model.pdf?sfvrsn=2c33f891_2

Ellen MacArthur Foundation. (n.d.). *Circular Economy Introduction.* https://ellenmacarthurfoundation.org/topics/circuintrodlar-economy-uction/overview?gclid=CjwKCAjwue6hBhBVEiwA9YTx8D3-q9M5RwhOrqCvvDEj7aQkYEAstk1BUYm_Y7iDfue-dgr8NyKEjxoCa1gQAvD_BwE

ESCAP. (2018). *Inequality in Asia and the Pacific in the Era of the 2030 Agenda for Sustainable Development.*

European Commission. (2017). Bioeconomy Report 2016.

European Parliament. (2023). *Circular Economy: Definition, Importance and Benefits.* https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits

EY Report. (2000). The Economic Contributions of the Biotechnology Industry to the U.S. Economy.

Geissdoerfer, M., Pieroni, M. P. P., Pigosso, D. C. A., & Soufani, K. (2020). Circular Business Models: A Review. *Journal of Cleaner Production, 277, 123741.*

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A New Sustainability Paradigm? *Journal of Cleaner Production, 143, 757–768.*

Groff, S. P. (2016). *Challenges Facing Asia and Pacific in Terms of Sustainable Development.* Asian Development Bank. https://blogs.adb.org/blog/challenges-facing-asia-and-pacific-terms-sustainable-development

Hussain, A., Arif, S. M., & Aslam, M. (2017). Emerging Renewable and Sustainable Energy Technologies: State of the Art. *Renewable and Sustainable Energy Reviews, 71,* 12–28.

IEA. (2013). *Annual Energy Outlook 2013.*

ILO. (2022). *Asia-Pacific Employment And Social Outlook Rethinking Sectoral Strategies For A Human-Centred Future Of Work 2022.* https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_862410.pdf

Kaewsang, C. (2020). Opportunities In the Bio-Circular-Green (BCG) Economy and BOI Support Measure. https://www.boi.go.th/upload/content/BOI-BCG_DSG%20Chokedee.pdf

Kahle, L. R., & Gurel-Atay, E. (2015). *Communicating Sustainability for the Green Economy.* London Routledge.

Kalia, C., & Tyagi, S. (2021, March). *Why Integrating ESG Into Your Business Could Be the Key* To Its Resilience. EY. https://www.ey.com/en_in/climate-change-sustainability-services/why-integrating-esg-into-your-business-could-be-the-key-to-its-resilience

Kumagai, S. (2022). BCG (Bio-Circular-Green) Economy in Thailand. Pacific Business and Industries, XXII (84).

Loe, C. (2023, February 9). Thailand's Sustainability Policy: Getting Its Act Together. Economist. https://www.eiu.com/n/thailand-sustainability-policy-getting-its-act-together/

Lu, S., & Zou, C. (2023, March 13). China 30/60: Tracking the Financing of China's Green Transition. Rhodium Group. https://rhg.com/research/china-30-60-tracking-the-financing-of-chinas-green-transition/

Lybecker, K. M., & Lohse, S. (2015). Innovation and Diffusion of Green Technologies: The Role of Intellectual Property and Other Enabling Factors. World Intellectual Property Organization. https://www.wipo.int/publications/en/details.jsp?id=3924

Mazzucato, M. (2018). Mission-Oriented Innovation Policies: Challenges and Opportunities. Industrial and Corporate Change, 27(5), 803–815.

McKinsey. (2016). Managing Waste in Emerging Markets. https://www.mckinsey.com/capabilities/sustainability/our-insights/managing-waste-in-emerging-markets

Ministry of Sustainability and the Environment, Singapore. (2023). Speech by Minister Grace Fu at COS 2023. https://www.mse.gov.sg/resource-room/category/2023-03-02-speech-by-minister-grace-fu-at-cos-2023

National Science and Technology Development Agency (NSTDA). *(2022a). Bio-Circular-Green Economy Action Plan.* https://www.bcg.in.th/eng/wp-content/uploads/2022/07/BCG_Action_Plan_-Eng_Small.pdf

National Science and Technology Development Agency (NSTDA). (2022b). BCG Policy Board Greenlights New Measures to Drive BCG Agenda. https://www.bcg.in.th/eng/bcg-policy-board-greenlights-new-measures-to-drive-bcg-agenda/

National Science and Technology Development Agency (NSTDA). (2021a). *Background – BCG Economy Model.* https://www.bcg.in.th/eng/background/#:~:text=The%20model%20aims%20at%20applying

National Science and Technology Development Agency (NSTDA). (2021b). Goals and Indicators. https://www.bcg.in.th/eng/goals-and-indicators/

OECD. (2001). Technological Change. OECD Environment Outlook.

OECD. (2002). Technology Policy and the Environment.

XXXXXhttps://www.oecd.org/science/inno/1830589.pdf

OECD. (2016). Working Party on Biotechnology, Nanotechnology and Converging Technologies.

OECD. (2020). Environment Directorate. https://one.oecd.org/document/ENV/WKP(2020)2/En/pdf

OECD. (2021). Towards a More Resource-Efficient and Circular Economy: the Role of The G20. https://www.oecd.org/environment/waste/OECD-G20-Towards-a-more-Resource-Efficient-and-Circular-Economy.pdf

OECD. (2023, March 6). OECD Science, Technology and Innovation Outlook 2023: Enabling Transition in Time of Disruption. https://www.oecd-ilibrary.org/sites/0b55736e-en/1/3/3/index.html?itemId=/content/publication/0b55736e-en&_csp_=b2412cc0600196af8b299a715946ac12&itemIGO=oecd&itemContentType=

book#section-d1e10865-7f8688cbf0

Official Gazette of the Republic of Chile. (2022). *Climate Change Framework Law.* https://www.diariooficial.interior.gob.cl/publicaciones/2022/06/13/43277/01/2142067.pdf

Ogihara, A. (2007). Overview of the Asia-Pacific Region. *Institute for Global Environmental Strategies.* https://www.iges.or.jp/en/publication_documents/pub/policyreport/en/154/3_overview.pdf

Rodriguez-Melo, A., & Mansouri, S. A. (2011). Stakeholder Engagement: Defining Strategic Advantage for Sustainable Construction. *Business Strategy and the Environment, 20(8),* 539–552.

Royal Thai Government. (2021). *PM: Govt to Declare BCG Economy a National Agenda.* https://www.thaigov.go.th/news/contents/details/31624

Sangwongwanich, P. (2023, March 3). Thailand Targets $57 Billion Investment in Green, Tech *Sectors. Bloomberg.com.* https://www.bloomberg.com/news/articles/2023-03-03/thailand-targets-57-billion-investment-in-green-tech-sectors

Santos, R., Antunes, P., Baptista, G., Mateus, P., & Madruga, L. (2006). Stakeholder Participation in the Design of Environmental Policy Mixes. *Ecological Economics, 60*(1), 100–110.

Seesung, W. (2021). Media Exposure to and Knowledge of the BCG Economic Development Policy Model of the Thai People. *Jurnal Komunikasi Pembangunan, 19*(02), 83–96.

Shah, K. U., Arjoon, S., & Rambocas, M. (2016). Aligning Corporate Social Responsibility with Green Economy Development Pathways in Developing Countries. Sustainable *Development, 24(4), 237–253.*

Shinn, L. (2019, January 11). *Renewable Energy: The Clean Facts.* NRDC. https://www.nrdc.org/stories/renewable-energy-clean-facts#sec-whatis

Singapore Government. (2021a). *Green Plan 2030: Overview.* https://www.greenplan.gov.sg/overview

Singapore Government. (2021b). *Green Economy.* https://www.greenplan.gov.sg/key-focus-areas/green-economy/

State Council of the People's Republic of China. (2021). *Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China.* http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm

Talaviya, T., Shah, D., Patel, N., Yagnik, H., & Shah, M. (2020). Implementation of Artificial Intelligence in Agriculture for Optimisation of Irrigation and Application of Pesticides and Herbicides. *Artificial Intelligence in Agriculture, 4.*

U.S. Environmental Protection Agency. (2023, May 26). *What is a Circular Economy?* https://www.epa.gov/circulareconomy/what-circular-economy

UNCTD. (2023). *Technology and Innovation Report 2023.* https://unctad.org/system/files/official-document/tir2022_en.pdf

UNEP. (2017, September 16). *The Economics of Land Degradation in Africa: Benefits of Action Outweigh the Costs; A Complementary Report To the ELD Initiative.* https://www.unep.org/resources/report/economics-land-degradation-africa-benefits-action-outweigh-costsa-complementary

UNEP. (2018, October 23). *Green Economy.* https://www.unep.org/pt-br/node/23750#:~:text=The%20UN%20Environment%20Programme%20has

UNFCCC. (2006). *Technologies for Adaptation to Climate Change.* https://unfccc.int/resource/docs/publications/tech_for_adaptation_06.pdf

Verma, A., Gautam, S. P., Bansal, K. K., Prabhakar, N., & Rosenholm, J. M. (2019). Green Nanotechnology: Advancement in Phytoformulation Research. *Medicines, 6(1), 39.*

White House. (2023, September 9). Fact Sheet: *President Biden's Budget Lowers Energy Costs, Combats the Climate Crisis, and Advances Environmental Justice.* https://www.whitehouse.gov/omb/briefing-room/2023/03/09/fact-sheet-president-bidens-budget-lowers-energy-costs-combats-the-climate-crisis-and-advances-environmental-justice/

White House. (2022, September 12). *Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American* Bioeconomy. https://www.whitehouse.gov/briefing-room/presidential-actions/2022/09/12/executive-order-on-advancing-biotechnology-and-biomanufacturing-innovation-for-a-sustainable-safe-and-secure-american-bioeconomy/

World Economic Forum. (2023, January 4). How Chile is becoming a leader in renewable energy. https://www.weforum.org/agenda/2023/01/how-chile-is-becoming-a-leader-in-renewable-energy/

WWF. (2009). *GHG Emission Reductions with Industrial Biotechnology: Assessing the Opportunities.*

WWF. *(2023). Soil Erosion and Degradation.* https://www.worldwildlife.org/threats/soil-erosion-and-degradation

Xiao, Y., & Watson, M. (2019). Guidance on Conducting a Systematic Literature Review. Journal of Planning Education and Research, 39(1), 93-112.

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