BIOECONOMY TRANSFORMATION PROGRAMME

Enriching the Nation, Securing the Future



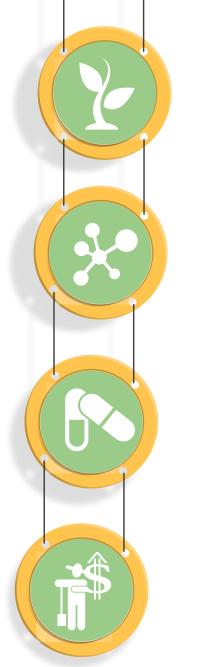


ANNUAL REPORT 2015

ENRICHING THE NATION, SECURING THE FUTURE







<u>02</u>

MESSAGE BY PRIME MINISTER OF MALAYSIA

<u>04</u>

MESSAGE BY MINISTER OF SCIENCE, TECHNOLOGY AND INNOVATION

<u>06</u>

MESSAGE FROM CHAIRMAN OF MALAYSIAN BIOTECHNOLOGY CORPORATION

<u>08</u>

CHIEF EXECUTIVE OFFICER'S REPORT

<u>12</u>

BOARD OF DIRECTORS

<u>14</u>

THE SENIOR MANAGEMENT TEAM

<u> 16</u>

BIOECONOMY AROUND THE GLOBE

<u>20</u>

BIOECONOMY IN MALAYSIA

<u>23</u>

BIOECONOMY TRANSFORMATION PROGRAMME (BTP)

<u>26</u>

BTP BY NUMBERS

<u>30</u>

PROGRESS OF BTP TRIGGER PROJECTS (AGBIOTECH)

<u>32</u>

PROGRESS OF BTP TRIGGER PROJECTS (BIOINDUSTRIAL)

<u>34</u>

PROGRESS OF BTP TRIGGER PROJECTS (BIOMEDICAL)

<u>36</u>

BIOECONOMY COMMUNITY DEVELOPMENT PROGRAMME (BCDP)

<u>40</u>

BENCHMARKING THE MALAYSIAN BIOECONOMY

44 KEY EVENTS

46 BENEFITS OF BTP/ BCDP

48 MOVING FORWARD

49 PUBLICATIONS

50 ACKNOWLEDGEMENT

MESSAGE BY PRIME MINISTER OF MALAYSIA

02

THE 11MP IS ANCHORED ON SIX STRATEGIC THRUSTS WHICH WILL ENABLE MALAYSIA TO HARNESS OPPORTUNITIES AND OVERCOME CHALLENGES AMID A FAST-PACED GLOBAL ECONOMIC ENVIRONMENT.



Y.A.B. DATO' SRI MOHD NAJIB BIN TUN HAJI ABDUL RAZAK Prime Minister of Malaysia The creation of value-added activities driven by bio-based technology and greater collaborations among government agencies, research institutions, academia as well as global Bioeconomy players in developing a full fledged innovation ecosystem will further amplify our economic transformation drive.

Our success in becoming a developed nation lies just over the horizon, and it is vital that we remain committed to our efforts and ensure we achieve our aspirations of sustainable and inclusive growth.

To this end, the 11th Malaysia Plan 2016-2020 (11MP) has been developed to propel us forward during this final phase of our transformation into a high-income economy.

The 11MP is anchored on six strategic thrusts which will enable Malaysia to harness opportunities and overcome challenges amid a fast-paced global economic environment. With its initiatives closely aligned to the 11MP's strategic thrusts, the Ministry of Science, Technology and Innovation (MOSTI) and Malaysian Biotechnology Corporation's (BiotechCorp) programmes, such as the Bioeconomy Transformation Programme (BTP) and the Bioeconomy Community Development Programme (BCDP), will play a crucial role in achieving our goal of becoming a high-income and inclusive economy, as outlined below:

• Enhancing inclusiveness towards an equitable society

- Improving well-being for all
- Accelerating human capital development for an advanced nation
- Pursuing green growth for sustainability and resilience
- Strengthening infrastructure to support economic expansion
- Re-engineering economic growth for greater prosperity.

The BTP and BCDP are also aligned with four of the Game Changers identified by the Government to accelerate Malaysia's economic development as follows:

- Unlocking the potential of productivity
- Uplifting the B40 households towards a middle-class society
- Embarking on green growth
- Translating innovation to wealth.

These alignments fit well with the foundation of our growth by 2020 and beyond, contributing towards knowledge-based economy. The creation of value-added activities driven by bio-based technology and greater collaborations among government agencies, research institutions, academia as well as global Bioeconomy players in developing a full-fledged innovation ecosystem will further amplify our economic transformation drive.

I would like to take this opportunity to congratulate MOSTI and BiotechCorp for continuing to champion Malaysia's Bioeconomy agenda and contributing to economic growth that is inclusive and equitable, ensuring sustainable growth in our country so that together, we can steer Malaysia towards fully developed nation status by 2020.



Y.A.B. Dato' Sri Mohd Najib bin Tun Haji Abdul Razak *Prime Minister of Malaysia*

MESSAGE BY MINISTER OF SCIENCE, TECHNOLOGY AND INNOVATION

THE NEED HAS ARISEN TO ALIGN STRATEGIES FOR THE THIRD PHASE OF THE NBP AND BEYOND 2020, WITH THE ESTABLISHMENT OF A CLEAR BIOECONOMY POLICY TO ENSURE BIOECONOMY-RELATED INITIATIVES SUCCESSFULLY CONTRIBUTE TO MALAYSIA'S TRANSFORMATION INTO A HIGH-INCOME ECONOMY.



Y.B. DATUK SERI PANGLIMA MADIUS TANGAU Minister of Science, Technology and Innovation



In line with Malaysia's fast-track development of biotechnology following the launch of the National Biotechnology Policy (NBP) in April 2005, the Bioeconomy Transformation Programme (BTP) was incepted in 2012 to further accelerate the country's Bioeconomy development.

While these efforts have well-placed Malaysia to harness emerging opportunities in the Bioeconomy in tandem with our country's transformation into a high-income nation by 2020, the time has also come for us to consider opportunities and challenges which lie beyond the next five years.

Malaysia's Bioeconomy agenda is spearheaded by the Ministry of Science, Technology and Innovation (MOSTI) and strategic approaches will be further developed to match long-term goals and adapt to new challenges. The need has arisen to align strategies for the Third Phase of the NBP and Beyond 2020, with the establishment of a clear Bioeconomy Policy to ensure Bioeconomy-related initiatives successfully contribute to Malaysia's transformation into a high-income economy. With these developments on hand, it is useful to take stock of our position thus far. The year 2020 is just five years away, and we are racing against time to further unlock economic growth and maintain Malaysia's competitiveness in the global economy.

In developed and industrialised countries such as the United States, China and Germany, the Science, Technology and Innovation (STI) policy forms the foundation for their innovation and economic development.

Thus, our STI policy must also no doubt be central to enhance the nation's knowledge-based economy as well as in formulating the overarching policy that cuts across Federal Ministries and State Governments. As a result, it is imperative for all Ministries with science-based initiatives to integrate STI within their policies to drive their projects to the fullest potential. Coordination and synergy between Ministries and State Governments are therefore key ingredients in building Malaysia's knowledgebased economy.

Our STI policy and knowledge-based economy is centred on bio-based technology, which has proven to meet growing demand for sustainable and renewable bio-based products to address global challenges such as food and health security, resource sufficiency, climate change and economic growth. The policies focus on enabling access to technologies and linking the industrial value chain to achieve greater productivity and sustainable development. This importance of bio-based technology has been highlighted by the Organisation for Economic Cooperation and Development (OECD), which published "The Bioeconomy to 2030: Designing a Policy Agenda" report on the future developments in agriculture, health and industry sectors in which biotechnology has the greatest potential impact.

Malaysia's implementation of the BTP, formulated by MOSTI three years ago, reflects this growing significance of the Bioeconomy. It also makes our country the first country in ASEAN and second after China in Asia to implement Bioeconomy initiatives.

Through the BTP, the Government and industry players will work in tandem to achieve national goals through bio-based technology. The Programme's core strategies focus on the complete value chain approach to increase multiplier effects for a sustainable economy and create a positive impact on the income and welfare of the people. The abundance of renewable biological resources in our country provides the opportunity for the growth of the Bioeconomy through research and innovation.

The BTP continues to draw support from industry players and public stakeholders, including universities, research institutes and government agencies working together to achieve greater productivity and sustainable development as well as to channel and maximise commercial opportunities in bio-based technology. We are confident that with these continued efforts, the Bioeconomy will spur equitable development for the rakyat.

On our part, MOSTI has nurtured a strong ecosystem that allows positive engagement between agencies to participate in the Bioeconomy agenda. MOSTI's agencies such as the National Institute of Biotechnology (NIBM), Nuclear Malaysia, Nano Malaysia, SIRIM and MIMOS are involved in the pre-commercialisation approach. BiotechCorp, on the other hand, together with the Malaysian Technology Development Corporation (MTDC) and Malaysia Debt Ventures Berhad (MDV) are responsible for approaches such as facilitation and commercialisation, while other agencies like the Malaysia Remote Sensing Agency (ARSM), Cybersecurity Malaysia and Malaysia Design Council represent the enablers for the commercialisation approach.

Direct engagement with these established partners is vital to position Malaysia and its value proposition as an emerging bio-based hub in the Asia Pacific. With the support of MOSTI as the Ministry for the knowledge-based economy, Malaysia possesses boundless potential to become a global powerhouse in the Bioeconomy in the future.

As we move forward, a concerted effort by all relevant stakeholders is required for the Bioeconomy to flourish and contribute to the knowledgebased economy in Malaysia. The formula for success will strongly depend on effective partnerships and collaborations at many levels across different fields and with a number of active participants from the public and private sectors.

MOSTI will continue to champion this agenda and I am happy to be heading these initiatives.

Y.B. Datuk Seri Panglima Madius Tangau Minister of Science, Technology and Innovation

MESSAGE FROM CHAIRMAN OF MALAYSIAN BIOTECHNOLOGY CORPORATION

TO ACHIEVE OUR TARGET OF HAVING 20 MALAYSIAN GLOBAL COMPANIES BY THE YEAR 2020, IT IS IMPERATIVE THAT WE CONTINUE TO ESTABLISH INTERNATIONAL LINKS WITH OTHER BIOECONOMY PLAYERS.

Y.BHG. PROFESSOR TAN SRI ZAKRI ABDUL HAMID Chairman



With the year 2020 shortly upon us, it is crucial that we redouble our efforts in developing Malaysia's bio-based industry through innovation, high-impact projects and strategic collaborations in order to propel us into the next phase of economic growth, as we transform into a developed nation.

As we embark towards the National Biotechnology Policy's Phase 3 – Going Global (2016 – 2020), efforts must now be made to enable Malaysia to make its mark on the global Bioeconomy.

The development of the Bioeconomy in Malaysia not only requires a strong network within the country but also global inter-linkages. In view of this, in the year under review BiotechCorp entered into various collaboration proposals with our counterparts in Germany, Italy and Belgium to build strong international ties in the Bioeconomy.

The collaborations include agreements with Dechema Gesellschaft für Chemische Technik und Biotechnologie e.V., Germany to cooperate in the development of technology and innovation as well as education in processing and chemical engineering. We have also established a collaboration with the Association for the Development of Biotechnology (Assobiotec), Italy to promote co-operation between Malaysian and Italian bio-based businesses, providing opportunities for our countries to share best practices, innovative development and processes relating to bio-based technology.

Furthermore, through a collaboration agreement with Ghent Bio-Economy Valley (GBEV), GBEV and BiotechCorp will support companies and research institutes in the biobased industry in Belgium and Malaysia, with the aim of facilitating collaboration and the development of commercial applications in both countries.

We believe these collaborations will propel Malaysia's Bioeconomy into the global sphere and enhance our competitiveness in the bio-based industry, contributing towards greater economic growth for our country and promoting social inclusiveness for the rakyat.

To achieve our target of having 20 Malaysian global companies by the year 2020, it is imperative that we continue to establish international links with other Bioeconomy players.

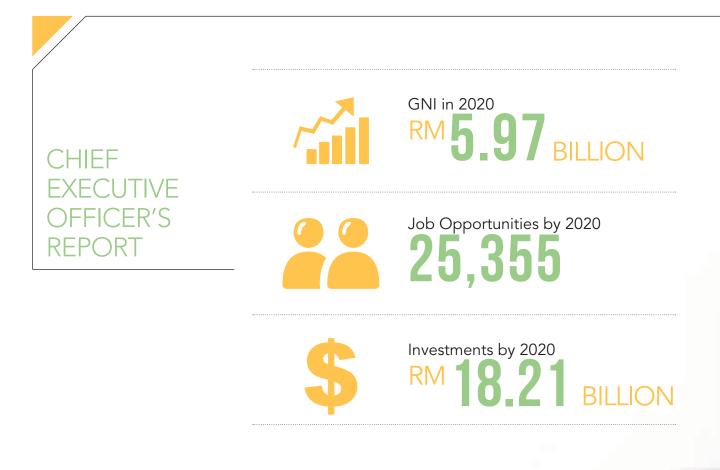
BiotechCorp also participated in the Global Bioeconomy Summit held in Germany, where we shared our plans on developing the Malaysian Bioeconomy. Not only did our participation in the event showcase Malaysia's growing prominence in Bioeconomy, it also marked our pledge to the three key areas of action that are crucial for the creation of a sustainable Bioeconomy agreed upon during the Summit.

These areas are:

- promoting innovations for a sustainable Bioeconomy
- establishing good governance for a sustainable Bioeconomy, and
- initiating and strengthening international dialogue and cooperation.

The progress of the BTP has shown positive development, supported by the strong foundation developed thus far. Nonetheless, with the year 2020 shortly upon us, it is crucial that we redouble our efforts in developing Malaysia's bio-based industry through innovation, highimpact projects and strategic collaborations in order to propel us into the next phase of economic growth, as we transform into a developed nation.

Y.Bhg. Professor Tan Sri Zakri Abdul Hamid Chairman





The BTP now boasts a total of 48 Trigger Projects which are expected to generate a total GNI of RM5.97 billion. In recent years, the Bioeconomy has become an important component of economic policies, as countries seek more sustainable and inclusive sources of growth to face rising pressures in food, feed, materials and energy. The bio-based industry has also been leveraged to drive innovation to help countries become more competitive, while uplifting society's quality of life.

I am pleased to report that Malaysia has shown similar advances in the Bioeconomy, driven by the Bioeconomy Transformation Programme (BTP). The BTP now boasts a total of 48 Trigger Projects which are expected to generate a total GNI of RM5.97 billion in 2020, provide 25,355 job opportunities and secure cumulative investments of RM18.21 billion by 2020.

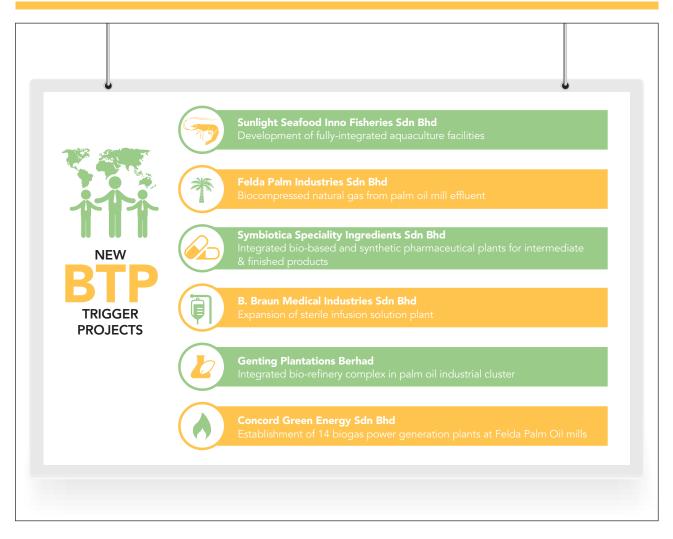
TO DATE, 23 BCDP PROJECTS HAVE KICKED OFF ACROSS JOHOR, MELAKA, TERENGGANU AND PENANG INVOLVING MORE THAN 300 FARMERS, WITH A TARGETED ADDITIONAL AVERAGE MONTHLY INCOME OF RM4,300 FOR EACH FARMER.

DATO' DR. MOHD NAZLEE KAMAL Chief Executive Officer 09

CHIEF EXECUTIVE OFFICER'S REPORT (CONTINUED)

During the year, the following high-impact projects secured major investments:

HIGHLIGHTS OF NEW BTP TRIGGER PROJECTS



The BTP Fund, provided in collaboration with Malaysia Debt Ventures Berhad (MDV), continued to facilitate the commercialisation of science, technology and innovation. To date, RM11.85 million of the BTP Fund has been approved to qualified BTP companies undertaking Bioeconomy projects across Malaysia. We expect to see higher numbers of BTP Fund recipients in the near future which will help to grow the Malaysian Bioeconomy. While the BTP Fund offers funding of up to 10% of the total project cost, it is designed to serve as a 'tipping point' or 'bridging' mechanism to spur the participation of other investors and financial institutions, whose involvement is crucial in ensuring the success of Bioeconomy projects. In an effort to further encourage their participation, BiotechCorp organised the Bioeconomy Investment Networking Session with financial institutions, venture capitalists and crowdfunders in December 2015. On the other hand, I am happy to share that the Bioeconomy Community Development Programme (BCDP) has been endorsed as part of Malaysia's National Blue Ocean Strategy (NBOS) initiatives on 27 April 2015 since it was mentioned during the Budget Speech 2014 by the Prime Minister.

To date, 23 BCDP projects have kicked off across Johor, Melaka, Terengganu and Penang involving more than 300 farmers, with a targeted additional average monthly income of RM4,300 for each farmer.

These achievements reflect a positive growth of the the Bioeconomy in Malaysia, contributing to the development and well-being of our communities, including the B40 group.

As part of our efforts to raise awareness on the Bioeconomy to the public, MOSTI and BiotechCorp organised the Bioeconomy Day in conjunction with the BioMalaysia & ASEAN Bioeconomy Conference & Exhibition in Putra World Trade Centre, Kuala Lumpur in August 2015 and in Le Meridien Kota Kinabalu, Sabah in November 2015.

The event was also aimed at promoting the BTP and the BCDP, highlighting the achievements of the programmes and other BiotechCorp initiatives as well as identifying projects which can be included in the programmes.

As we endeavour to achieve the BTP's targets of securing RM48 billion of Gross National Income (GNI), creating 170,000 new job opportunities and capturing investment of RM50 billion by the year 2020, we have identified more opportunities in the Bioeconomy. These include activities in Food Crops, Aquaculture, Food Processing, Medical Devices, Bio-based Chemicals, Bio-cosmeceuticals, Wellness and Pharma-Nutrition which offer strong potential to maximise our country's rich biodiversity and place Malaysia on the forefront of the global bio-based industry.

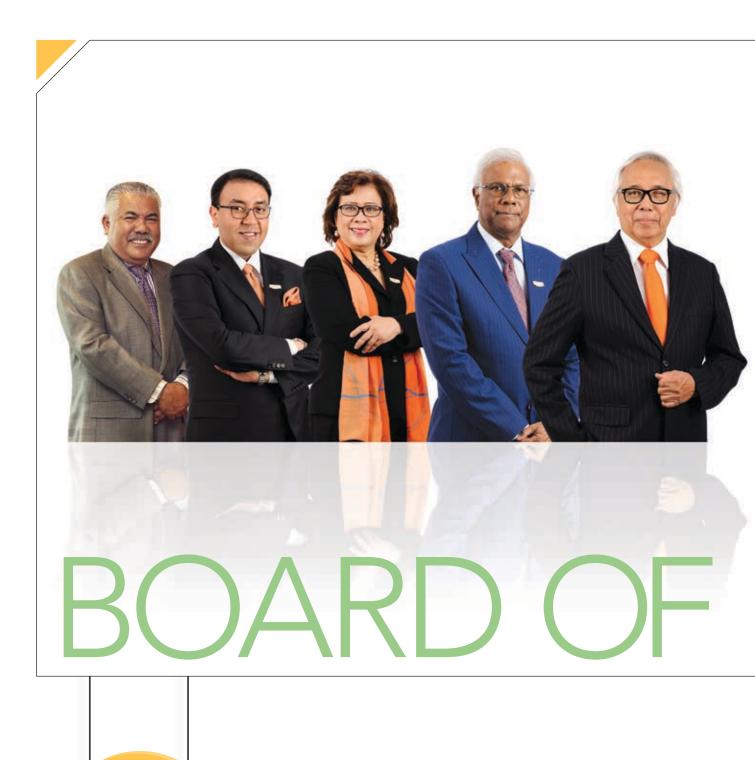
Furthermore, BiotechCorp is currently developing the Bioeconomy Contribution Index (BCI), a tool to measure the overall condition of the Malaysian Bioeconomy contribution specifically to identify trends, patterns and synergies for future policy decisions. The BCI aims to emulate a measure of Bioeconomy contribution similar to Holland's System Analysis Tools Framework for Bio-based Economy Strategy (SAT-BBE) and the European Union's BioEconomy Regional Strategy Toolkit (BERST). It is our hope that the BCI will become a global benchmark to measure Bioeconomy contribution.

Based on these initiatives, we are confident that Malaysia has paved a solid foundation to develop our excellence in Bioeconomy to bring the nation at par with the other Bioeconomy countries.

Moving forward, as we close off another successful year for the BTP and BCDP, allow me to take this opportunity to extend my appreciation to MOSTI, BTP and BCDP companies as well as relevant stakeholders for supporting the Bioeconomy agenda in Malaysia.

Unordinagleed D.

Dato' Dr. Mohd Nazlee Kamal Chief Executive Officer



from left: Y.BHG. DATO' MOHD ARIF AB RAHMAN Y.BHG. DATUK WAN AHMAD SHIHAB WAN ISMAIL Y.BHG. DATO' SRI DR. NOORUL AINUR MOHD. NUR Y.BHG. TAN SRI DATO' DR. JEGATHESAN A/L N.M. VASAGAM Y.BHG. PROFESSOR TAN SRI ZAKRI ABDUL HAMID



from left:

Y.BHG. DATO' DR. MOHD NAZLEE KAMAL
Y.BHG. DATUK DR. NOOR HISHAM ABDULLAH
Y.BHG. DATUK DR. ABD HAPIZ ABDULLAH
DR. RADZUAN A. RAHMAN
PUAN NORSIMAH AB WAHAB
ENCIK AMIRUL FARES WAN ZAHIR

ANNUAL REPORT 2015

THE SENIOR MANAGEMENT TEAM



- 01 Y.BHG. DATO' DR. MOHD NAZLEE KAMAL Chief Executive Officer
- 02 ENCIK RAZWIN SULAIREE HASNAN TERMIZI Chief Operating Officer
- 03 TUAN SYED AGIL SYED HASHIM Chief Financial Officer
- 04 DR. ABDUL MANAF MOHAMMAD RADZI Senior Vice President, University-Industry Partnership
- 05 CIK SHARIFAH HANIFAH SYED ABDUL AZIZ Senior Vice President, Legal & Secretarial
- 06 ENCIK JAY PADASIAN Senior Vice President, Business Development and Investment – BioMedical
- 07 ENCIK ZAINAL AZMAN BIN ABU KASIM Senior Vice President, Business Development and Investment – BioIndustrial
- 08 DR. KODI ISPARAN KANDASAMY Senior Vice President, Business Development and Investment – AgBiotech
- 09 PUAN ZURINA CHE DIR Senior Vice President, Bioeconomy Programme & Delivery Management
- 10 DR. HARCHARAN SINGH Senior Vice President, Technology Management & Innovation
- 11 ENCIK ADRIAN ABDUL GHANI Senior Vice President, BioNexus Development
- 12 ENCIK ADNAN BAHARUM Senior Vice President, CEO's Office



BIOECONOMY

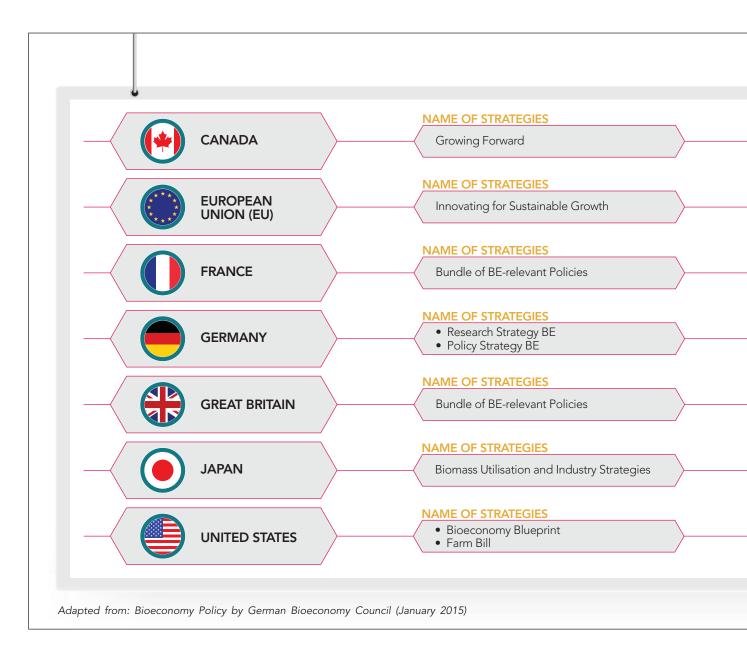
AROUND

THE GLOBE

Global Bioeconomy Initiatives

The Bioeconomy has emerged as a vital component of economic policy in countries around the globe, promoting not only growth, but also technological innovation, ecological sustainability and resource efficiency. It has been noted that in the past 10 years, Bioeconomy strategies undertaken by a number of countries have focused on research and policy-making. As a result, there exist opportunities for countries to learn from each other's experience in the Bioeconomy and thus knowledge-sharing from Bioeconomy research and innovation should be encouraged.

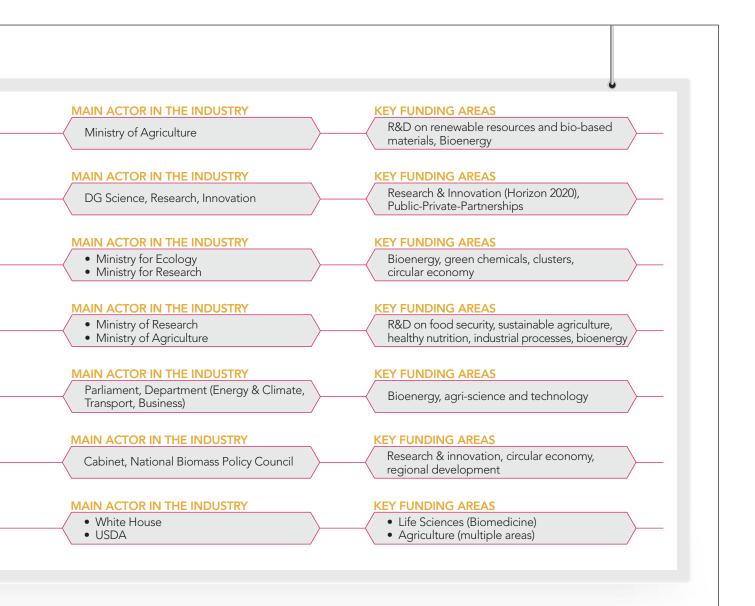
Additionally, during the Global Bioeconomy Summit 2015, three key areas of action were also agreed on for the creation of a sustainable Bioeconomy. The first area is in the promotion of innovations for a sustainable Bioeconomy, which will require innovation policy measures aimed at optimising bio-based value networks and minimising waste and losses.



The second key area of action calls for the establishment of good governance for a sustainable Bioeconomy, given the risk of conflicts between societal goals and stakeholder interests in the production and use of resources that may arise in the global development of the Bioeconomy. This must be addressed through national and local policy-making, thus creating a need for harmonisation in international policy frameworks and inter-governmental negotiations.

The third key area of action is centred on initiating and strengthening international dialogue and cooperation, which is crucial to drive sustainable Bioeconomy research, innovation and policy making while ensuring sustainable development at all levels. In this respect, an international platform to bring together scientists, policymakers, civil society and the private sector may prove valuable.

The following table provides a summary of Bioeconomy strategies and policies adopted by the world's largest economies:



BIOECONOMY AROUND THE GLOBE (CONTINUED)



Source: German Bioeconomy Council (June 2015), http://biooekonomierat.de



DEDICATED BIOECONOMY STRATEGY

PARTIAL BIOECONOMY STRATEGY

BIOECONOMY STRATEGY UNDER DEVELOPMENT

19

BIOECONOMY IN MALAYSIA

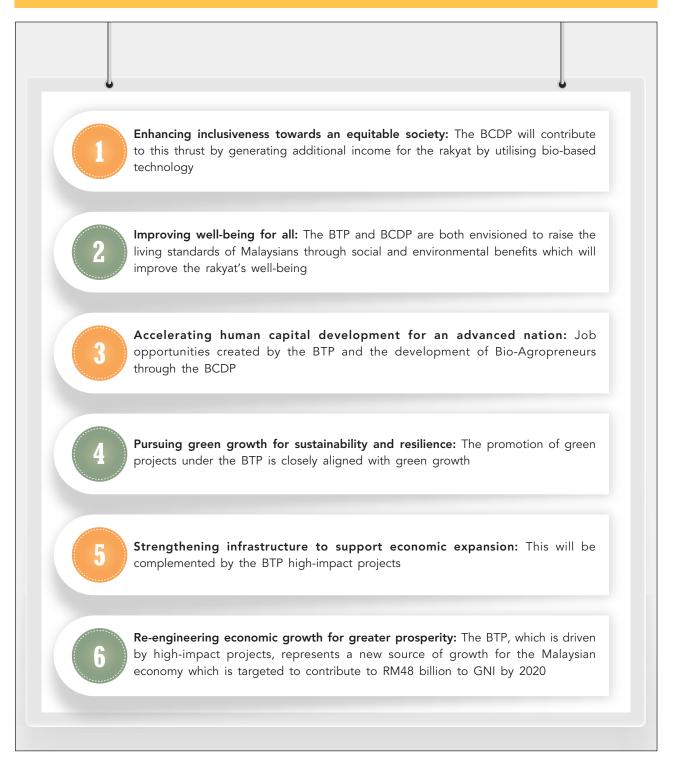
In 2005, the Malaysian Government introduced the National Biotechnology Policy (NBP), a 15-year plan aimed at making biotechnology a key contributor to economic growth. With the past 10 years spent nurturing the ecosystem for biotechnology in Malaysia and laying the foundations for the industry's growth, the Government has since widened its scope to build a Bioeconomy that is projected to contribute 8%-10% to the Gross Domestic Product by 2020.

This resulted in the establishment of the Bioeconomy Transformation Programme (BTP) in 2012, making Malaysia the first in ASEAN and the second in Asia, after China, to initiate a comprehensive plan for the development of the Bioeconomy.

Aimed at accelerating Malaysia's Bioeconomy agenda, the BTP acts as a platform for the private sector to harness commercial opportunities in biobased industries, with a focus on biotechnology. In addition to contributing to economic growth, activities within the Bioeconomy are envisioned to aid in raising agricultural productivity, pave the way for breakthroughs in healthcare and promote the adoption of sustainable industrial processes. In a broader context, these developments are seen to address global challenges such as the growing global population, food security issues, depletion of fossil fuel and natural resources, as well as increasing environmental pressures and climate change.

During the Budget Speech 2014, the Government launched the Bioeconomy Community Development Programme (BCDP) to develop the rural Bioeconomy by optimising upstream agricultural activities of farmers and smallholders to be channeled to BioNexus Status companies and BTP project owners through a guaranteed buy-back agreement. This helps to secure raw materials for downstream activities and improve farmers' income. The BCDP has also been given prominence through its inclusion in the National Blue Ocean Strategy (NBOS) initiative. Both the BTP and BCDP are closely aligned with the six strategic thrusts identified under the 11th Malaysia Plan (11MP) to allow Malaysia to explore opportunities and address challenges amid the fast-changing global economic environment. This is illustrated as follows:

STRATEGIC THRUSTS





BIOECONOMY IN MALAYSIA (CONTINUED)

The BTP and BCDP are also aligned with four of the Game Changers identified by the Government to accelerate Malaysia's economic development as follows:

GAME CHANGERS





By Year **2020** Create

BIOECONOMY TRANSFORMATION PROGRAMME (BTP)

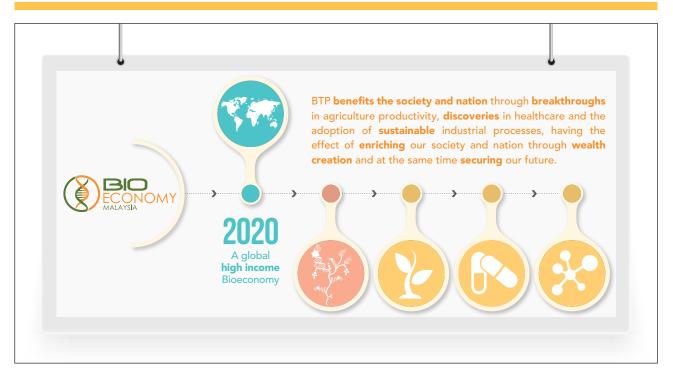
> As a catalyst to transform the country into a developed nation, the BTP provides the opportunity to complement and add value to existing products and services, production processes, business models and financial returns of other industries.

The BTP is designed to promote a knowledge-based economy through the establishment of a sustainable ecosystem of research and development, commercialisation in the areas of agriculture, healthcare and industrial biotechnology and fostering public-private interactions in developing and exploring high-impact opportunities in biotechnology.

investments

170,000 JOBS

OVERVIEW OF BIOECONOMY TRANSFORMATION PROGRAMME (BTP)



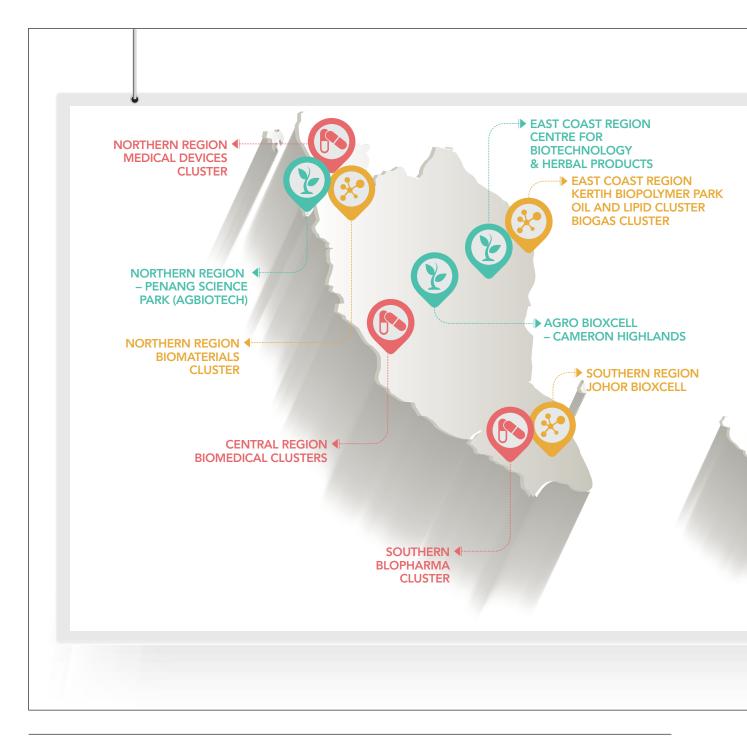
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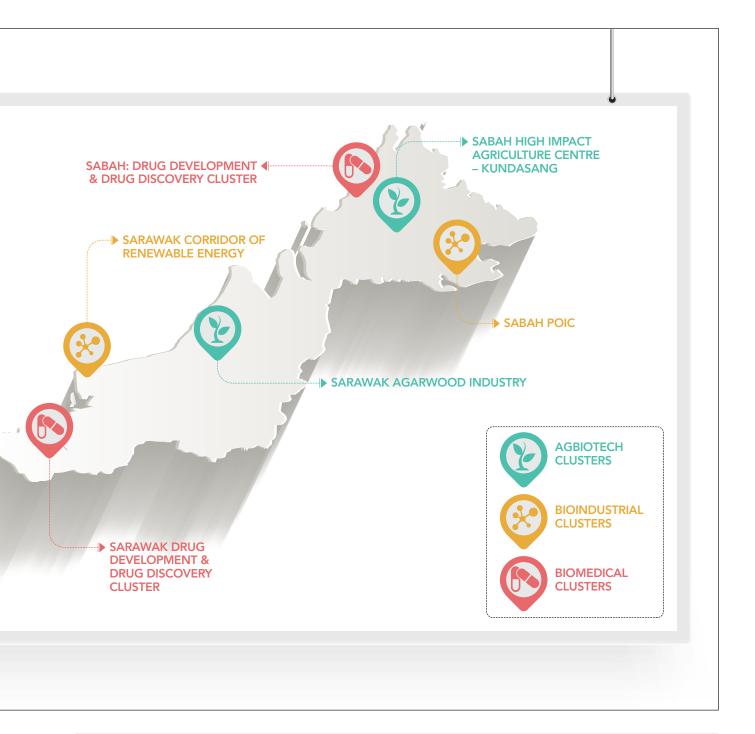
BIOECONOMY TRANSFORMATION PROGRAMME (BTP) (CONTINUED)

24

The programme also serves as a channel for the Government to put in place the structural conditions required and develop necessary mechanisms to ensure policies can adapt to new opportunities.

Furthermore, the BTP leverages the growth potential of the Bioeconomy in Malaysia through the development of clusters in the country's five economic corridors, namely the Northern Corridor Economic Region, the East Coast Economic Region, Iskandar Malaysia, Sarawak Corridor of Renewable Energy and Sabah Development Corridor.

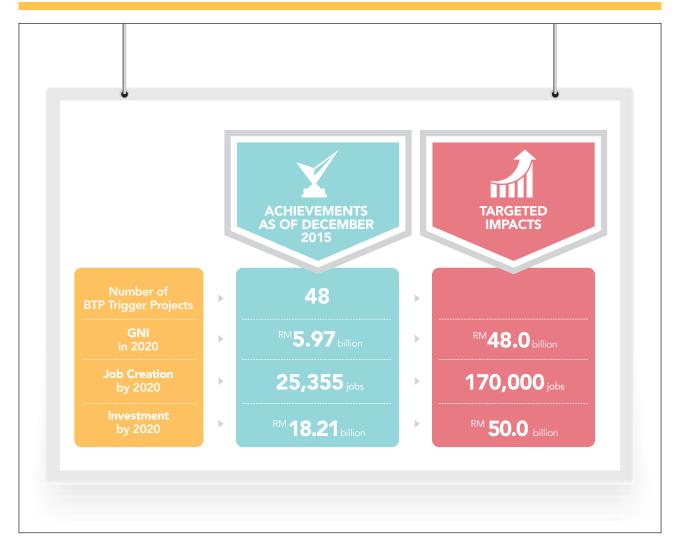






The BTP continued to record marked progress in 2015, led by an increase in the number of BTP Trigger Projects to 48 as of December 2015, from 25 as at December 2014. In 2020, these projects will contribute RM5.97 billion in GNI, and create 25,355 employment opportunities and RM18.21 billion in investment by 2020.

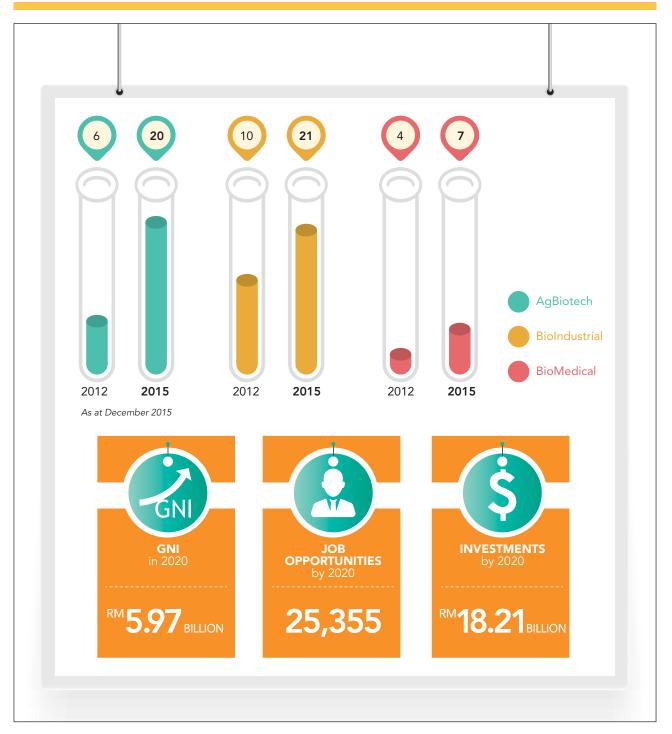
PROGRESS OF BTP AS AT 30 DECEMBER 2015



26

Of the 48 BTP Trigger Projects, 20 are AgBiotech projects, 21 are BioIndustrial projects and seven are BioMedical projects.

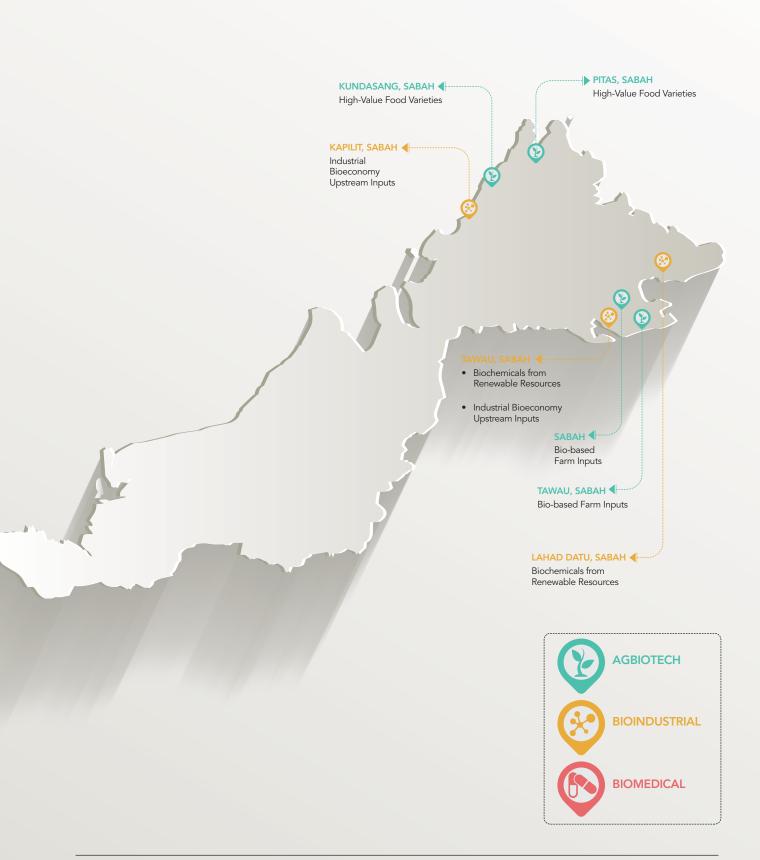
NUMBER OF BTP TRIGGER PROJECTS AND BREAKDOWN BY SECTOR



BTP BY NUMBERS (CONTINUED)

The following map shows the location and type of BTP projects:





29



NO	PROJECT TITLE	EPP	CURRENT STATUS
1	Setting up a High-Value Fresh Mushroom Facility	A3: High-Value Food Varieties	0
2	Development and Commercialisation of High-Value Tropical Abalone Aquaculture	A3: High-Value Food Varieties	0
3	Production of Advanced Bio-Therapeutic Extract (ATE) from Cocos Nutrifera Milk for Health and Wellness Products	A2: High-Value Bioingredients	0
4	Development of Fully Integrated Shrimp Aquaculture Facilities	A3: High-Value Food Varieties	0
5	Mass Cultivation of Haematococcus Pluvialis for the Production of Natural Astaxanthin	A2: High-Value Bioingredients	0
6	Production and Commercialisation of MD2 Pineapple	A3: High-Value Food Varieties	0

NO	PROJECT TITLE	EPP	CURRENT STATUS
7	Converting Palm Oil Waste to Biofertilisers through the Implementation of Integrated Waste Treatment Plants	A1: Bio-based Farm Inputs	0
8	Development of Fully Integrated Multi-platform Finfish Aquaculture Facilities	A3: High-Value Food Varieties	\bigcirc
9	Liquid Immersion Bioreactor (LIB) Method to Commercialise MD2 Pineapple Plantlets	A3: High-Value Food Varieties	0
10	Commercialisation of Bees Farming and Processing of Honey and its Byproducts	A2: High-Value Bioingredients	0
11	Expansion of Shiitake Mushroom Production	A3: High-Value Food Varieties	0
12	Cultivation and Processing of Haematococcus Pluvialis Biomass for the Production of Astaxanthin	A2: High-Value Bioingredients	0
13	Premium Edible Bird's Nest & Downstream Products	A3: High-Value Food Varieties	0
14	Research, Development and Manufacture of Emulsifiers and Stabilisers	A2: High-Value Bioingredients	0
15	Scale up Production of High-Value Mushroom Varieties	A3: High-Value Food Varieties	0
16	Develop Plantation, Extraction and Commercialisation of Mangosteen	A2: High-Value Bioingredients	\bigcirc
17	Conversion of Agri-Waste into Biofertilisers through Implementation of Integrated Waste Treatment Plants	A1: Bio-based Farm Inputs	\bigcirc
18	Scale up Production and Commercialisation of Bio-feed for Livestock Industry	A1: Bio-based Farm Inputs	
19	Scale up Plantation, Extraction & Commercialisation of Stevia as an Alternative Sweetener for Food & Beverages	A2: High-Value Bioingredients	\bigcirc
20	Develop, Produce and Commercialise Indigenous Hybrid Seed	A3: High-Value Food Varieties	\bigcirc

Moderate Progress

Low Progress



NO	PROJECT TITLE	EPP	CURRENT STATUS
1	Expansion of cGMP Stearic Acid and Medium Chain Triglycerides (MCT) Powder Plants	I2: Biochemicals from Renewable Resources	0
2	Integrated Bio-Refinery Complex in Palm Oil Industrial Cluster	I2: Biochemicals from Renewable Resources	0
3	Bio-Compressed Natural Gas (BioCNG) from Palm Oil Mill Effluent	I1: Industrial Bioeconomy Upstream Inputs	0
4	Setting up Five Biogas Power Generation Plants at Felcra Mills based on Feed-in-Tariff Model	I1: Industrial Bioeconomy Upstream Inputs	0
5	Setting up Bio-based Waste Management Facilities in Iskandar Malaysia	14: Bioremediation	0
6	Research, Development and Manufacturing of Biodegradable Packaging Products from Agricultural Biomass Waste Materials	I3: Biomaterials from Renewable Resources	0
7	Setting up Biogas Power Generation Plant at Kapilit Palm Oil Mill	I1: Industrial Bioeconomy Upstream Inputs	0

NO	PROJECT TITLE	EPP	CURRENT STATUS
8	Setting up 14 Biogas Power Generation Plants at Felda Palm Oil Mills based on Feed-in-Tariff Model	I1: Industrial Bioeconomy Upstream Inputs	0
9	Biogas Power Generation at Felda Kahang based on Feed-in-Tariff Model	I1: Industrial Bioeconomy Upstream Inputs	0
10	Bio-based Chemical Production using Renewable Palm Oil Derivatives	I2: Biochemicals from Renewable Resources	0
11	Renewable Production of L-Methionine and Thiochemicals	I2: Biochemicals from Renewable Resources	0
12	Establishment of an Energy Crop Plantation as Input for the Industrial Bioeconomy	I1: Industrial Bioeconomy Upstream Inputs	0
13	Production of Syngas for Steam Generation from Solid Biomass	I1: Industrial Bioeconomy Upstream Inputs	\bigcirc
14	Establishment of Commercial Production of PHBH from Palm Oil and its Byproducts & Derivatives	I3: Biomaterials from Renewable Resources	\bigcirc
15	Production of Biopolyols for Biopolyurethanes from Palm Oil Derived Oleic Acid	I3: Biomaterials from Renewable Resources	\bigcirc
16	Agro-based Bioresin Production for Bioplastics Use	I3: Biomaterials from Renewable Resources	\bigcirc
17	Production of Isobutanol from Cellulosic Feedstocks (Wood Chips)	I2: Biochemicals from Renewable Resources	\bigcirc
18	Production and Utilisation of Compressed Biomethane Gas (CBG) for Transportation and Industrial Sectors	I1: Industrial Bioeconomy Upstream Inputs	\bigcirc
19	Production of Cellulosic Sugars from Woody Biomass Produced by Energy Crop Plantations	I2: Biochemicals from Renewable Resources	\bigcirc
20	Scale up Production and Promote Usage of Biodegradable & Compostable Packaging Products from Sustainable Agro-Waste	I3: Biomaterials from Renewable Resources	\bigcirc
21	Bioethanol and Biomethanol Production from Wood Chips	I2: Biochemicals from Renewable Resources	\bigcirc

Moderate Progress

Low Progress



NO	PROJECT TITLE	EPP	CURRENT STATUS
1	Expansion of Sterile Infusion Solution Plant	M1: Biopharmaceuticals	0
2	Research, Development and Manufacturing of Rapid Test Kits for In Vitro Diagnostic Application	M3: Molecular Screening and Diagnostics	0
3	Integrated Bio-based and Synthetic Pharmaceutical Plants for Intermediates and Finished Products	M1: Biopharmaceuticals	0
4	Scale up Innovative Molecular Screening and Diagnostics (MSD) Products and Services	M3: Molecular Screening and Diagnostics	0
5	Accelerate Development, Production & Commercialisation of Malaysian Made Biotech Drugs	M1: Biopharmaceuticals	0
6	Promote, Encourage and Ensure Progress of Stem Cells and Regenerative Medicine in Malaysia	M4: Stem Cells & Regenerative Medicine	0
7	Drug Discovery Services and IP Development around Natural Products	M2: Drug Discovery & Preclinical Services	



Low Progress

BIOECONOMY COMMUNITY DEVELOPMENT PROGRAMME (BCDP)



Rural Bioeconomy possesses significant potential to be developed into a major contributor to Malaysia's economic growth. Based on a stimulated growth rate of 15%, rural segments of the Bioeconomy, such as smallholder agriculture and aquaculture can contribute RM24.1 billion to the Malaysian GDP in 2030. This could double to RM48.3 billion if advanced bio-based technology is applied across the sector with appropriate policy actions.

RURAL BIOECONOMY CAN DEVELOP FURTHER AS A CONTRIBUTOR TO OUR ECONOMY

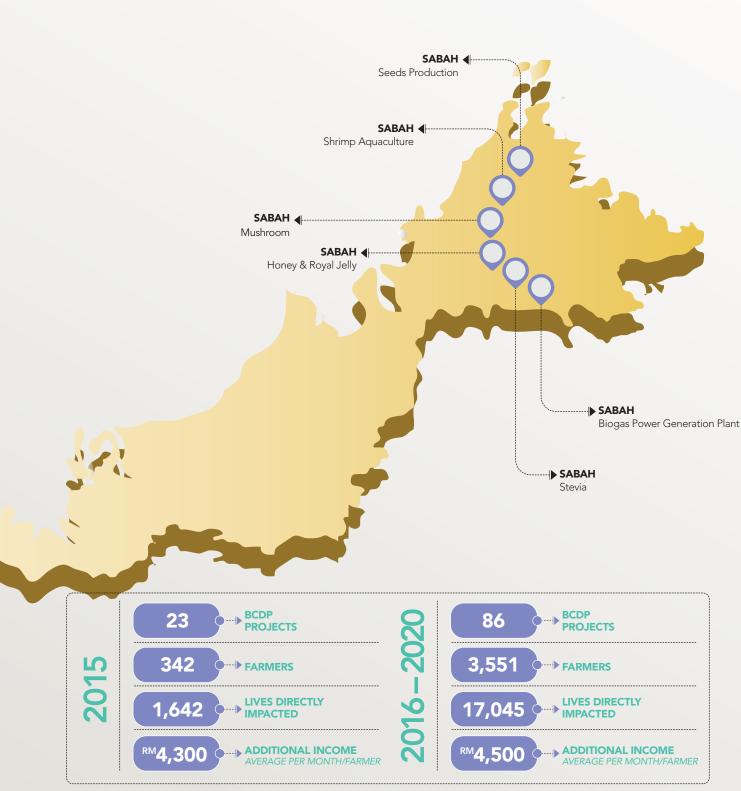


MAIN OBJECTIVES OF BCDP To ensure stable and consistent supply of raw \mathbf{A} BTP trigger projects through sustainable supply of raw 0 φ φ σ To maximise idle lands through application of biotechnology

BIOECONOMY COMMUNITY DEVELOPMENT PROGRAMME (BCDP) (CONTINUED)

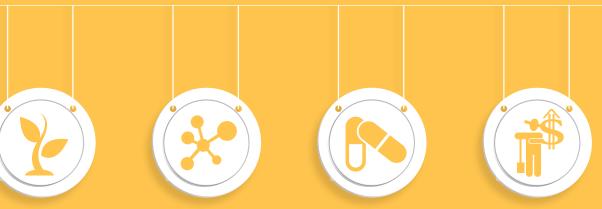
The following map shows the location and type of BCDP projects:





* as of December 2015 22 contract farming projects and 1 community project

BENCHMARKING THE MALAYSIAN BIOECONOMY



ON AVERAGE, THE INDEX GREW BY 5.43% ANNUALLY FROM 2005 TO 2015.



In monitoring the development of the Bioeconomy in Malaysia, efforts have been undertaken to standardise, globalise and align various international Bioeconomy programmes. These efforts include the European Commission's Bioeconomy Observatory project.

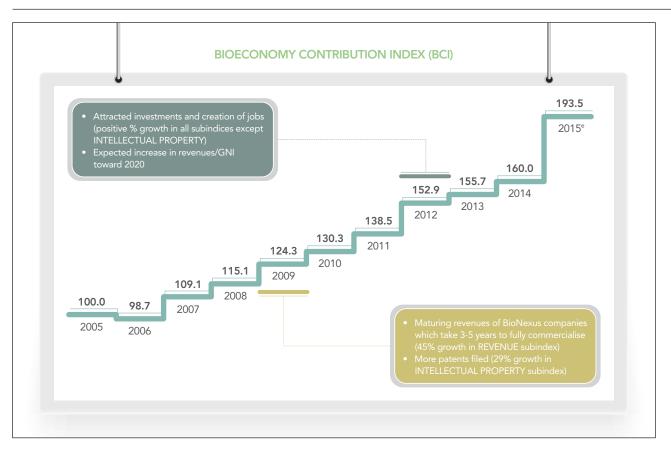
While monitoring of the Bioeconomy in Malaysia is still at its preliminary stages, there is already a need for data to be packaged and communicated in a meaningful form to enable analysis and interpretation. It is proposed that a clear and standardised methodology be developed to capture the overall condition of a nation's Bioeconomy and eventually be used as a comparative tool to identify trends, patterns, and synergies which can form the basis of future policy decisions.

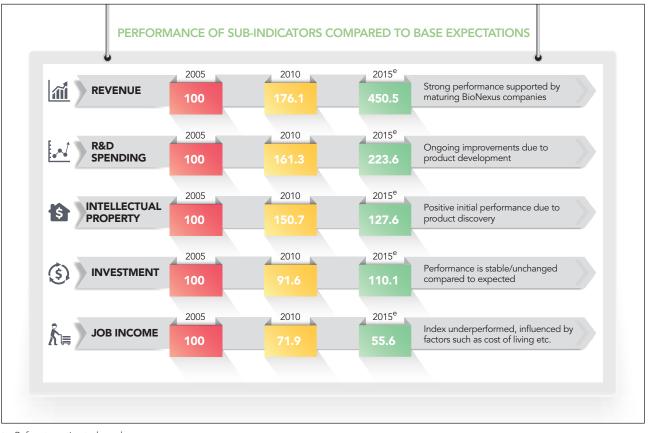
The Bioeconomy Contribution Index (BCI) methodology is one such tool. It quantifies economic contribution by comparing actual accomplishments of selected indicators to real expectations. The BCI can put into context the frameworks, activities, limitations, next steps and the establishment of a new scope to address any challenges in promoting and developing the Bioeconomy in Malaysia.

The BCI specifies five indicators: **Revenue**, **Investment**, **R&D Spending**, **Employment Income**, and **Intellectual Property** to evaluate Bioeconomy performance. Crucially, it also computes an expected base performance for each of these indicators to assess the relative actual performance for specific parameters. The adjusted expected baseline works to convert the nominal values of a parameter into real values, which is then combined with other identifiers to form the BCI. This baseline uses a dynamic computable general equilibrium (DCGE) approach for its estimation.



BENCHMARKING THE MALAYSIAN BIOECONOMY (CONTINUED)





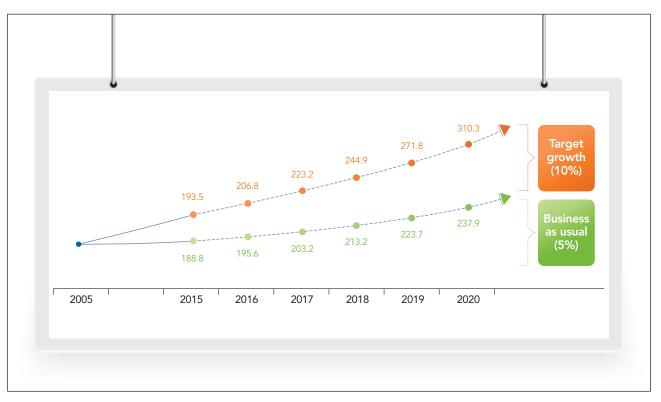
• Refers to estimated number

The previous chart shows the overall calculated results of the yearly BCI findings from 2005 to 2015. In general, the index grew steadily during this period, although there were periods of significant increase due to strong performance of the sub-indicators. On average, the index grew by 5.43% annually with strong performance recorded in 2009 and 2012.

During the same period, the performance of the sub-indices matched or exceeded adjusted base year expectations, and with the exception of Job Income, showed positive trends over the period under review. The decline in Job Income is attributed to its inability to demonstrate achievements as expected compared to the base performance expected in the model. Therefore, this is one area which policy makers can analyse to identify the factors that led to the decline and formulate solutions to address the problems.

The BCI is envisioned as a tool to assess the status of the Bioeconomy in a quick, consistent and comprehensive manner to enable targeted and timely policy and strategy implementation. The effectiveness of these policies is crucial given the short timeframe BiotechCorp has set on its targets on GNI, investment, and employment by the year 2020 as specified under the National Bioeconomy Policy.

In order to achieve these goals, regular strategic reviews, alignment of actions, performance, execution, and monitoring evaluation are necessary. The BCI will thus aid in identifying priority sectors and provide a basis for formulation of economic strategies going forward.



The model is still under development and subject to changes upon consultation with relevant stakeholders.

KEY EVENTS



11 FEBRUARY 2015

Exchange of Collaboration Proposal between BiotechCorp and DECHEMA to support Bioeconomy business and research

Venue: Kuala Lumpur



18 FEBRUARY 2015

Presentation on Bioeconomy Community Development Programme (BCDP) Proposal for RMK-11 to representatives from 18 relevant stakeholders at the first BCDP Stakeholder Meeting





17 – 19 AUGUST 2015

BioMalaysia & ASEAN Bioeconomy 2015 Conference & Exhibition (BioMalaysia) Venue: PWTC, Kuala Lumpur



27 JULY 2015

First Honey Harvest Ceremony for

BCDP Bee Farming Project

Venue: Kuala Linggi, Melaka



9 JUNE 2015

Exchange of Collaboration Proposal between BiotechCorp and Italian Association for the Development of Biotechnology (Assobiotec), during Bioeconomy Partnering Day

Venue: Milan, Italy



17 AUGUST 2015

Bioeconomy Day in conjunction with BioMalaysia & ASEAN Bioeconomy 2015 Conference & Exhibition

Venue: PWTC, Kuala Lumpur



31 AUGUST 2015

High Level Roundtable Discussion Meeting with Assobiotec and Italian Bio-based Companies/Universities/ Research Institutes

Venue: Milan, Italy

21 SEPTEMBER 2015

BCDP Awareness Workshop in collaboration with The Holstein Milk Co. Sdn Bhd to create awareness on BCDP

Venue: BiotechCorp HQ







2 MARCH 2015

Exchange of Collaboration Proposal Between Ghent Bio-Economy Valley and BiotechCorp to support Bioeconomy business and research

Venue: BiotechCorp HQ

19 MARCH 2015

Steering Committee Meeting on the approval of the 13 new BTP Trigger projects and 4 BTP Funds

Venue: MOSTI, Putrajaya

19 - 22 APRIL 2015

Promoting Bioeconomy initiatives at BioBorneo 2015 Exhibition Venue: Kota Kinabalu, Sabah



9 JUNE 2015

Product Launch by a BCDP Company, Flora Bee Hive during EXPO Milano

Venue: Milan, Italy



28 APRIL - 2 MAY 2015

Promoting Bioeconomy initiatives at Festival Bio-Kelantan & Teknologi Hijau Negeri Kelantan 2015

Venue: Kota Bharu, Kelantan



27 APRIL 2015

Endorsement of BCDP as part of Malaysia's National Blue Ocean Strategy (NBOS) initiatives

Venue: Bangunan Perdana Putra, Putrajaya



11 NOVEMBER 2015

Highlighting BTP and BCDP's current achievements at Bioeconomy Day

Venue: Kota Kinabalu, Sabah



24 – 26 NOVEMBER 2015

Participated in the Global Bioeconomy Summit Venue: Berlin, Germany



18 DECEMBER 2015

Bioeconomy Networking Investment Session Venue: Kuala Lumpur

BENEFITS OF BTP/BCDP

GOVERNMENT SUPPORT

Direct assistance and endorsement from the Government, represented by the relevant ministries, with continuous facilitation and advisory support through BiotechCorp which acts as the BTP Secretariat and Implementing Agency.

NATIONAL VISIBILITY

Opportunity for the private sector to participate in a key Government agenda, achieving visibility among important stakeholders in the public sector, investment community, and ordinary Malaysians. As a contributor to the nation's Bioeconomy Initiatives, participants benefit from being a part of Malaysia's greater Economic Transformation Programme (ETP).

FUNDING ACCESS

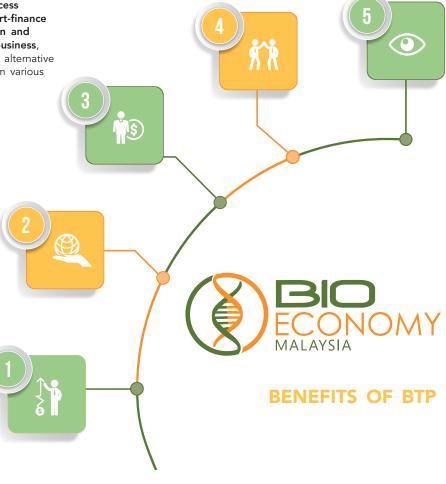
Private sector can access the BTP Fund to part-finance the commercialisation and expansion of their business, and be connected to alternative financing options from various agencies.

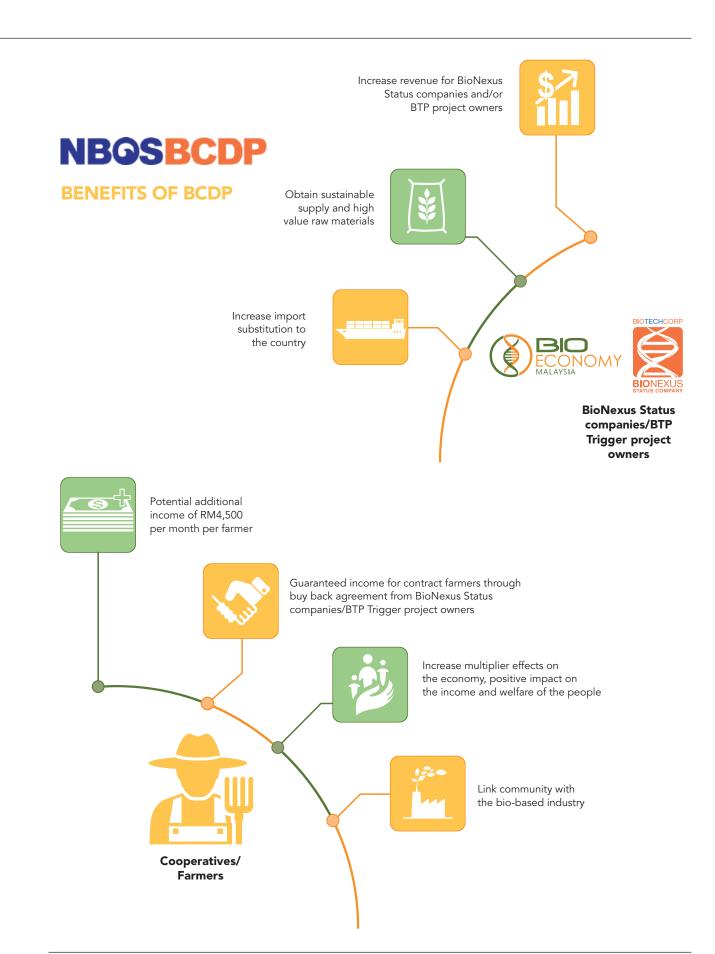
MARKET ACCESS

Opportunity to **expand market access** via BiotechCorp collaboration with the economic corridors and State development agencies to initiate collaborative Bioeconomy clusters for wealth creation and sharing the benefits of Bioeconomy throughout the country by expanding existing value chains and creating new ones.

BIO-ACCELERATORS

Opportunity to participate in the Bioeconomy Malaysia Accelerator Programmes (Bio-Accelerators) including Bioeconomy Community Development Programme, Technology Development & Innovation, BioNexus Go Global and Bio-Entrepreneurship to enhance and accelerate the growth of bio-based businesses.





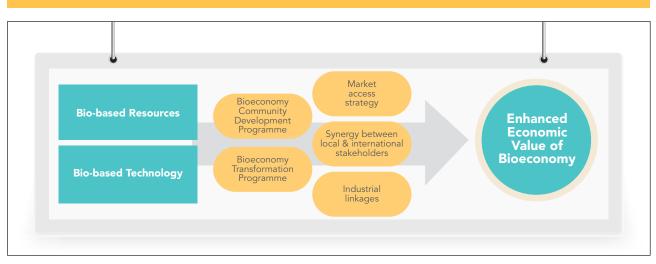
MOVING FORWARD

OPPORTUNITIES AND CHALLENGES

BiotechCorp has to be cognisant that the global Bioeconomy landscape is going to be increasingly challenging. We foresee greater volatility and uncertainties in the global economy as a result of the decline in oil prices, re-alignment of exchange rates as well as geopolitical risks. On the domestic front, there is a need for a greater resolution to boost productivity to drive economic growth, strengthen the fiscal position while ensuring adequate public and private funding to support continued economic expansion and raise the average income of the B40 group.

Despite the current economic landscape, the value of the Bioeconomy can be further enhanced by capitalising on the greater potential of the bio-based resources and latent technology in the country through multiple enablers under BiotechCorp's initiatives. The Bioeconomy should provide solutions for managing resources in a responsible, inclusive and efficient way. Technological and social innovations play a key role in achieving a sustainable Bioeconomy. Furthermore, potential conflicts between societal goals and the interests of stakeholders and rakyat need to be both acknowledged and appropriately addressed. Guided by the 11MP focusing on capital and people economies, these enablers include:

- Effective implementation of the Bioeconomy Community Development Programme (BCDP);
- 2) Increasing domestic investment through the Bioeconomy Transformation Programme (BTP);
- 3) Amplifying market access strategies;
- 4) Enhanced synergies between local and international stakeholders; and
- 5) Strengthening industrial linkages to support bio-based industry.



KEY ENABLERS TO ENHANCE BIOECONOMY

The enablers will spur productivity and innovation through an environmentally sustainable approach, bringing the bio-based industry to greater heights for the nation. The heightened level will subsequently provide sustained economic growth, create new Bioeconomy opportunities, and ensure continued well-being and prosperity of the rakyat which will remain relevant and resilient.

PUBLICATIONS

 Accelerating the Growth of the Bioeconomy in Malaysia (authors: Nazlee Kamal & Zurina Che Dir)

Advances in commercial application of biotechnology worldwide over the past two decades have led to the development of a Bioeconomy, whereby substantial economic outputs are from the development and use of biological materials. The Bioeconomy encompasses all industries and economic sectors based on the values implicit in biological materials that can be translated into new sources of income, environmental sustainability and social well-being.

Malaysia, one of the most competitive biotechnology hubs in the Asia-Pacific region, has also taken critical early steps to coordinate and intensify national efforts to harness the potential of the Bioeconomy. Most significantly, the Bioeconomy Transformation Programme (BTP) was launched in October 2012, making the country only the second in Asia, after China, and the first in ASEAN, to establish its own national Bioeconomy initiative. The BTP is in line with the Government's objective to develop Malaysia into a high-income nation by the year 2020. The BTP aims to achieve this by focusing on bio-based industries in Malaysia, a sector that has been identified as having enormous potential to further develop the nation due to the abundance of natural resources available. With the introduction of the BTP, Malaysia is now unlocking even greater opportunities in the local and regional biotechnology industry, and enhancing the participation of the private sector. Through effective execution strategies from the Government and BiotechCorp, the biotechnology sector is now directly contributing towards efforts to drive Malaysia towards a highincome and knowledge-based economy by year 2020.

Revealed Comparative Advantage of Bio-based Industries: A Malaysian Case Study (author: Ahmad Nazmi Idrus)

The paper adopts the Balassa's Revealed Comparative Advantage model through comparing the structure of Malaysia's specialisation in trade visà-vis the rest of the world to analyse the competitiveness of the country's bio-based industries. The paper gives a brief on the structure of Malaysian bio-based exports and its performance over time, and later applies the model to see how competitiveness in some of the products has evolved. The findings show that Malaysia has comparative advantages in oil & fats, organic chemicals and rubber. Meanwhile animal based, vegetable based, foodstuffs, pharmaceuticals and other products have comparative disadvantages. A discussion on the implications of the findings and possible policy reactions concludes the study.

 Bioeconomy Malaysia: Developing an Index for Quantifying Economic Impacts (authors: Assoc Prof. Dr. Abul Quasem Al-Amin, Zurina Che Dir, Nazlee Kamal in collaboration with Frontier Private Advisors Sdn Bhd) – in queue for publication

The development of biotechnology in Malaysia has led to an increased need to measure the industry's performance on a frequent basis. As such, the paper proposes that a specific methodology be developed to measure Bioeconomy contribution to the country, encompassing a multitude of measurable aspects, which can be packaged and communicated in a meaningful form to enable analysis and interpretation. Specifically, the paper proposes to create an index which includes quantifiable parameters namely revenue, investment, employment, research & development, and intellectual property. The parameters' performance are then compared with the results from a dynamic computable general equilibrium model to measure the real (as opposed to nominal) contributions. The result from the study indicates that the Malaysian Bioeconomy has grown steadily although performance is not equal across the parameters.

ACKNOWLEDGEMENT

BiotechCorp would like to take this opportunity to thank all the stakeholders i.e. Ministries and government agencies, states, economic corridors, university and research institutes as well as Bioeconomy industry players who have been supporting the Malaysian Bioeconomy agenda.



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