Spearheading the Nanotechnology Revolution

NANOMALAYSIA BERHAD STRATEGIC REPORT 2018

NANOMALAYSIA®

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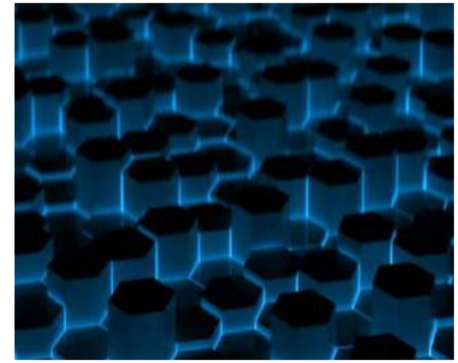

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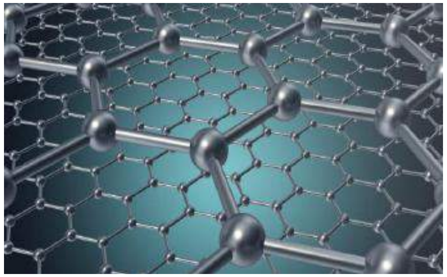


ABOUT THIS REPORT

NanoMalaysia Œ Z (‘NanoMalaysia’) Strategic Report 2018 has been prepared with the aim of providing our ecosystem of stakeholders with transparent and accountable disclosures on our activities to advance the sustainable growth of D o Ç•][• nanotechnology sector. As E v } D o Ç•][• inaugural Strategic Report, our aim is to clearly demonstrate to our stakeholders how we are creating value through our spectrum of programmes and initiatives, as guided by our strategy.

Report Boundary and Scope

This Strategic Report provides an account of activities conducted and outcomes achieved as at 31 December 2018, unless otherwise indicated. The report covers the primary activities of our core nanotechnology programmes. Disclosures within this report adhere to requirements of the which NanoMalaysia is mandated to conduct the following activities:

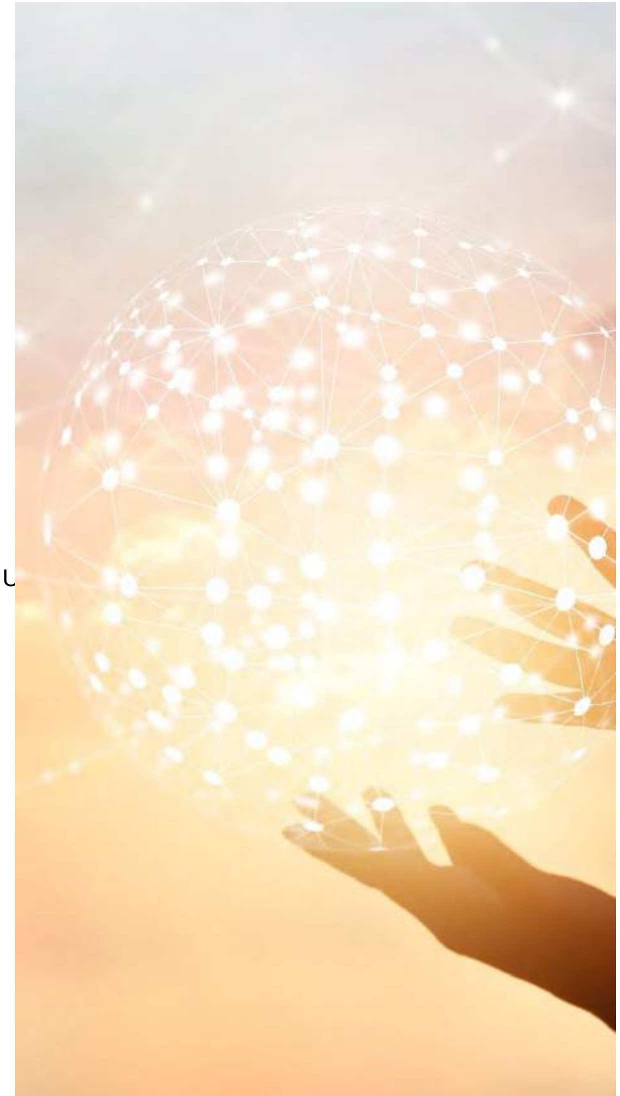
‡ Act as a business entity entrusted to focus on the commercialisation and development of nanotechnology
‡ Plan and coordinate the commercialisation of research and development (R&D) of nanotechnology in high-impact areas of focus such as electrical and electronics, food and agriculture, energy and environment, and health and medicine
‡ Plan and manage activities that contribute to the development of nanotechnology-based industries
‡ Strategise the positioning of nanotechnology industry of Malaysia in the global supply and value chain
‡ Facilitate investment in nanotechnology commercialisation
‡ Facilitate the development of human capital (scientists and engineers, researchers and professionals) in the nanotechnology industry

Approval by the Board of Directors

This report has been prepared in accordance with our commitment to maintain the highest levels of governance and ethics, under the oversight and guidance of our Board of Directors (Board). In approving the content of this Strategic Report, the Board acknowledges its responsibility to ensure the integrity of this report.

Forward Looking Statements

Forward looking statements contained within this report should be taken with a degree of caution as they are reliant on various events, risks, uncertainties and other factors beyond our control. These statements can be identified through the use of key words such as ^ o] À^•]_v Ŭ v _U ^Á]o oŰ%_Ub v^•}_µŠ o}] and other similar words in conjunction with discussions on future operating or financial performance. In the coming years, we will be able to report with more comprehensive data and better assess our focus areas.



Feedback

We welcome all constructive comments, thoughts and remarks.
These can be directed to:

NanoMalaysia Berhad (955265-P)
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Phone: +603 2166 8849
Fax: +603 2181 8849
Web: www.nanomalaysia.com.my
Email:
corporate.affairs@nanomalaysia.com.my

& + $, 5 0 $ 1 ¶ 6 MESSAGE

PROFESSOR EMERITUS DATO' IR. DR. MOHAMAD ZAWAWI BIN ISMAIL

Dear Stakeholders,

On behalf of the Board of Directors, I am pleased to present NanoMalaysia Œ Z (NanoMalaysia) inaugural Strategic Report for the year 2018.

Since our inception in 2011, NanoMalaysia has progressed from our initial positioning and branding efforts, to create substantial economic value in our journey of growth, especially within the last three years.

Our local and international network has expanded, as a result of the strong and viable business relationships and partnerships we have built and nurtured with Government Ministries, departments and agencies, as well as research institutes and academia. We have undertaken to share our progress and achievements through our Strategic Report, in line with our commitment to maintain high standards of transparency and accountability.

Delivering on Our Mandate

We have successfully delivered on our mandate to nurture and develop the nanotechnology sector in Malaysia. As at the end of 2018, NanoMalaysia has developed 55 project Intellectual Property (IPs), 10 patents, 4 copyrights and one utility innovation, which have been filed with MyIPO. As a result of our strategically focused industry programmes and platforms, a total of 64 products have been developed by industry and 13 products commercialised. NanoMalaysia remains steadfast as D o Ç •] [• lead agency to commercialise nanotechnology.

As we move into 2019 and beyond into the Fourth Industrial Revolution, NanoMalaysia will remain on course to drive the revolution towards the Internet of Nano Things (IoNT) through our REVOLUTIoNT Strategy. We believe our strategic approach puts us in a strong position to achieve long-term financial independence and business sustainability.

Appreciation

On behalf of the Board of Directors, I would like to express my sincere appreciation to the management and staff, for their dedicated efforts. We are also thankful for the continued support from our various stakeholders, project partners, academia and industry players. I also extend my deepest gratitude to my colleagues on the Board for their unstinting support and dedication.

May we continue to work together to achieve the mandate given to us here at NanoMalaysia.

Prof. Emeritus š }l[. Dr. Mohamad Zawawi Bin Ismail,
Chairman of NanoMalaysia Berhad

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DR REZAL KHAIRI AHMAD

Dear Stakeholders,

On behalf of NanoMalaysia Berhad (NanoMalaysia), it is my privilege to share with you our }ŒP v]•š]}v[• inaugural Strategic Report 2018. Through this report, we aim to share with our ecosystem of stakeholders the outcomes of our value creation activities as at 31 December 2018.

Playing a Pivotal Role in the Development of the the Malaysian Nanotechnology Sector

This is an auspicious publication for us, as 2018 marks E v}D o Ç•] [• 7th anniversary celebrations t 17 years since the Malaysian Government initiated research and development (R&D) on nanotechnology and categorised it as a Strategic Research (SR) program under the Intensification of Priority Research Area (IRPA) of the 8th Malaysian Plan (8MP).

In 2009, the National Innovation Council had identified nanoscience and technology as an important growth engine for the New Economic Policy (NEP) that would stimulate and accelerate development of home-grown nanotechnology into beneficial technologies. That same year, the National Nanotechnology Statement was developed, signifying the '}À Œvu vš[• commitment to advance the sector in our country.

NanoMalaysia was then incorporated in 2011 as a Company Limited by Guarantee (CLBG) under the then Ministry of Science, Technology and Innovation (MOSTI), which is now known as the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC). The mandate given to NanoMalaysia was to consolidate and spearhead the commercialisation and industrialisation of nanotechnology activities in Malaysia.

Spearheading the Nanotechnology Revolution

The ubiquity of nanotechnology pervades almost every aspect of our daily lives. From mobile phones and computers, to cosmetics and clothing, and nanoengineered batteries, fuel cells and catalytic converters, nanotechnology is being used in a wide variety of products and applications. On a regular basis, new nanomaterials are being incorporated into commercial products and industrial manufacturing processes.

The rapidly evolving pace of nanotechnology enabled developments means that going into the future, nanotechnology hold vast economic potential for businesses. Bearing this is mind, NanoMalaysia has charted our business development journey to ensure that we are able to reap the benefits and rewards of a nanotechnology driven economy.

Our sustained efforts since our inception has resulted in a number of achievements in line with our }ŒP v]•š]}v[• mandate. For the year 2018, NanoMalaysia conducted 14 product developments and executed eight scaleup projects. We also developed two Intellectual Property (IP), with five patents and three copyrights filed with MyIPO. So far, we have seen 12 joint-ventures or start-up companies supported or initiated, over 1,771 high value job opportunities created, and potential Gross National Income (GNI) contribution of RM3.4 billion over the next five years.

Smart and Global Partnerships is one of the key ways for us to grow our capacity. To ensure our sustainable growth into the long-term future, NanoMalaysia will continue with the international partnerships and collaborations we have forged with likeminded organisations, agencies and bodies, while being an active member and contributor to the Asia Nano Forum (ANF). We will also continue with our work in IP matching and funding through these partnerships.

The Fourth Industrial Revolution (4 IR) will see the growing importance of nanosensors, the Internet of Nano Things (IoNT) and graphene. The manufacturing industry is increasingly shifting towards producing more technologically complex products. It is no longer sufficient for the manufacturing industry to make better things by creating innovative products and services that will meet customer needs. Instead, industries need to adopt a mindset of ^u l] better things while making things šš.Œ_

This is where emerging technologies such as nanotechnology comes in. 4 IR is primarily powered by nanotechnology. Breakthroughs in nanotechnology are providing performance boosts and new functionalities to the Internet of Things (IoT), biotechnology, 3-D printing, materials science, energy storage, robotics, artificial intelligence, autonomous vehicles and quantum computing. To make the most of opportunities available within the realm of nanotechnology, we need to leverage on these nanotechnology enabled productivity enhancements and new functionalities.

Our Forward Moving Journey

As we move into 2019, NanoMalaysia is singularly focused on our strategic blueprint of REVOLUTIoNT, leveraging on IoNT, as the key driver for our sustainable long-term growth. We believe that IoNT will be the core driver of 4 IR, especially in applications such as energy storage, sensors, fuel cells, autonomous vehicles, RFID and solar light energy panels, catalysing revolutionary transformations in industry, business and society.

NanoMalaysia aims to continue to energise and re-energise industries and innovation in Malaysia through successful development and commercialisation of nanotechnology.

Appreciation

On behalf of everyone here at NanoMalaysia, I would like to extend my sincere thanks to all who have come into contact with me personally as well as other members of the NanoMalaysia team. I especially wish to extend our collective gratitude to officials of the then MOSTI (now known as MESTECC), as well as the Ministry of International Trade and Industry (MITI) for their guidance, support and confidence in entrusting us with leading the charge in the commercialisation of nanotechnology. On a more personal note, I wish to thank both MOSTI and MITI for the unstinting support and faith placed in me to lead NanoMalaysia.

As we continue with our journey, we reaffirm our commitment to catalyse the growth of the nanotechnology industry in Malaysia. , Œ š} the year ahead.

Rezal Khairi Ahmad
Chief Executive Officer

AT A GLANCE

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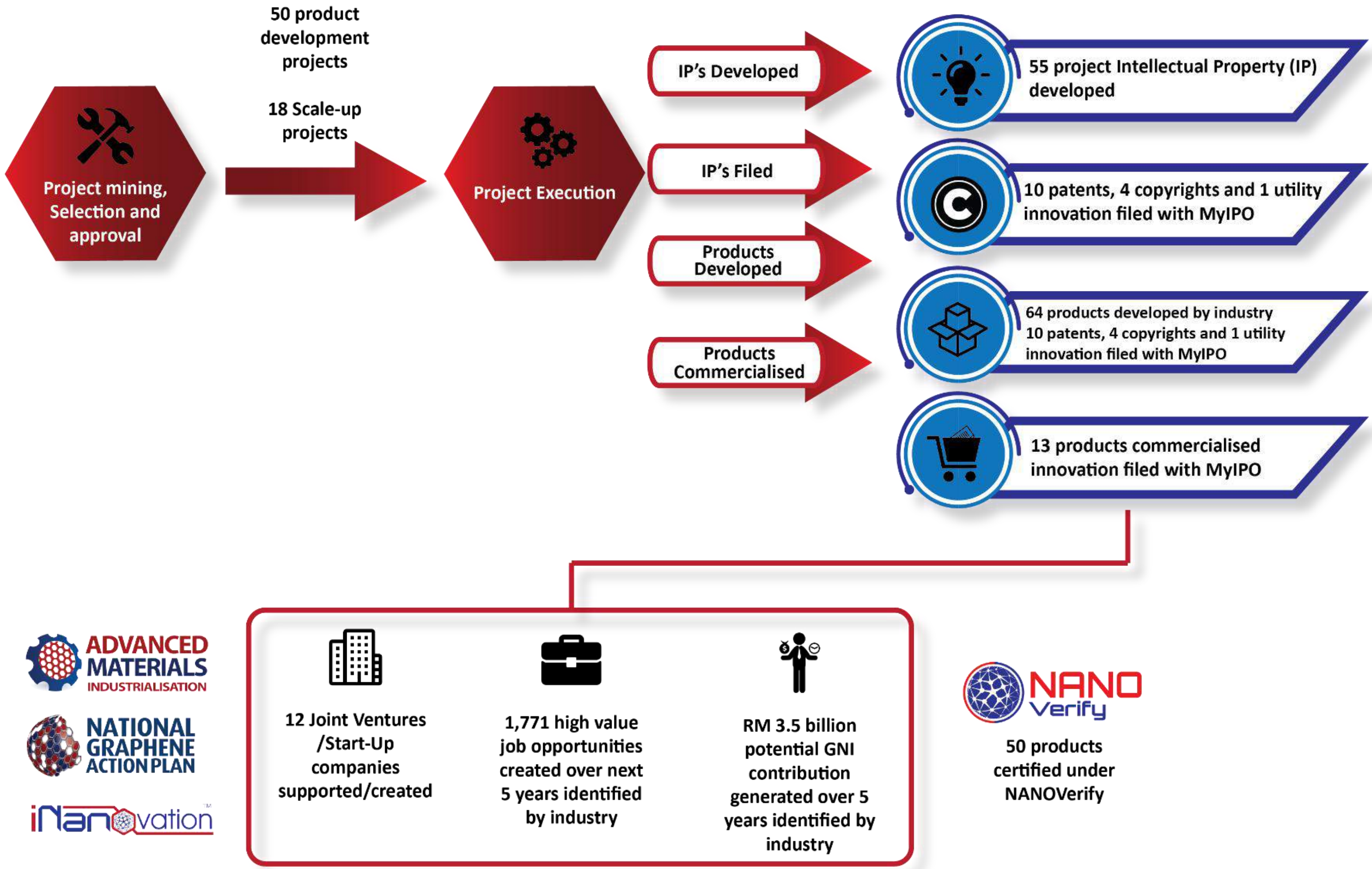
OUTCOMES & OUTPUT 2016-2018 FROM RMK-11



ANNUAL ACHIEVEMENT

ADVANCED MATERIALS INDUSTRIALISATION

Programmes (MITI)	Number of Projects	
Year	2016	2017
Advanced Materials Industialisation	4	5
Total Projects	9 Projects	

Projects under the Ministry of Energy, Science, Technology, Environment and Climate
Z v P [• ~D ^d •
Nanotechnology Commercialisation Programme of the 11th Malaysia Plan.

NATIONAL GRAPHENE ACTION PLAN

iNanovation

Programmes (MESTECC)	Number of Projects		
Year	2016	2017	2018
National Graphene Action Plan 2020 and iNanovation - Planned Projects	10	10	20
National Graphene Action Plan 2020 and iNanovation - Actual Projects	23	15	22
RMK - 11 Target	75 Projects		

Programmes under the Ministry of Industry and
/vš Œv š]}v o dŒ
High Value Added and Complex Product Development Programme
[• ~D/d/•

Note: Projects under MITI's auspices are subject to funding and approval by the Economic Planning Unit (now known as the Ministry of Economic Affairs). In 2018, priority was given to participation from other Government agencies.

ABOUT NANOMALAYSIA

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WHO WE ARE

NanoMalaysia Berhad (NanoMalaysia) is D o Ç • lead• agency responsible for the commercialisation of nanotechnology in the country. NanoMalaysia was incorporated by the Government of Malaysia in 2011, as the special purpose vehicle to spearhead the growth of the national nanotechnology sector. Nanotechnology was identified under the New Economic Model (2011 t 2020), as a crucial new growth engine and a key enabler to drive innovations across all technology-based sectors.

E v } D o Ç role [s• to provide support for commercial entities within the nanotechnology industry, to achieve targeted outcomes in moving towards an innovation-driven economy. Our support ecosystem includes global marketing activities, helping build sectoral talent, providing financial and infrastructure resources, assisting with technology and knowledge transfers, and catalysing product innovations leveraging on nanotechnology.

Consequently, NanoMalaysia Berhad was incorporated as a company limited by guarantee (CLBG) under the then Ministry of Science, Technology and Innovation (MOSTI), which has now become the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC).

NanoMalaysia has been entrusted with being the leading business entity in Malaysia, to advance nanotechnology commercialisation in the country.

Amongst its roles are:

- Commercialisation of nanotechnology research and development
- Industrialisation of nanotechnology
- Facilitating investments in nanotechnology
- Furthering human capital skills development in nanotechnology

Our goal is to catalyse the growth of Malaysia's strategic industrial sectors with nanotechnology through the various initiatives and programmes we have in place, towards creating a thriving innovation-driven national economy.

2004

Malaysia joined Asia Nano Forum

2006

The National Nanotechnology Initiative was launched

2009

The National Innovation Council identified Nanotechnology as an important growth engine for Malaysia's New Economic Policy

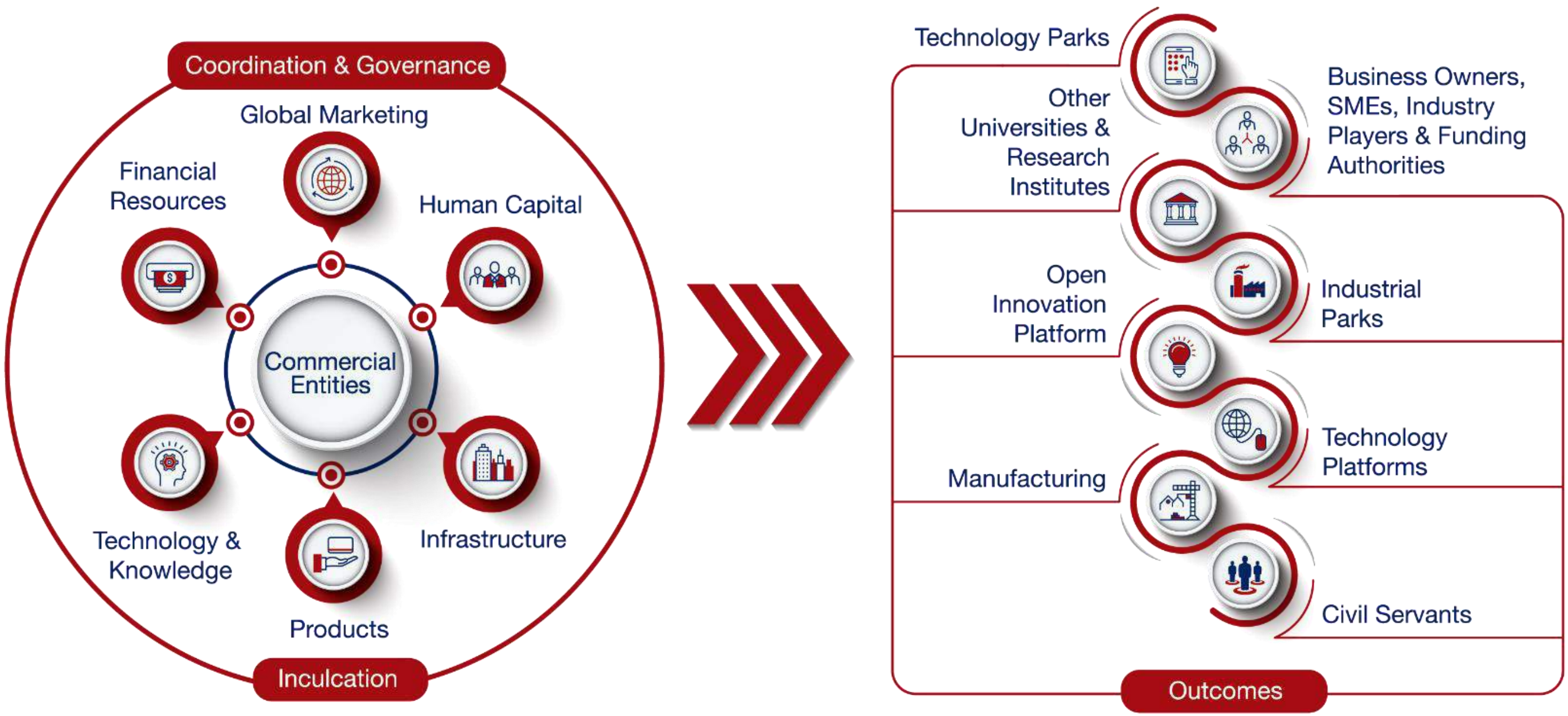
2010

The National Nanotechnology Directorate (NND) was established and laid out NanoMalaysia Programme 2011-2020

2011

NanoMalaysia was mooted during the National Innovation Council (NIC) meeting and incorporated as a Company Limited by Guarantee (CLBG) in August 2011 under section 14(2)(c) of the Companies Act 1965

OUR ECOSYSTEM



VISION

To be a global leader in nanotechnology commercialisation

MISSION

Energising Industries and Catalysing Economic Growth

Deployment and Adoption of Nanotechnology in Industries

Business Growth and Sustainable Development

Cutting Edge Technological Leadership and Creating True Values

COMPANY INFORMATION

Board of Directors:

- W Œ } (X u Œ] š µ • š } [Z Zawawi Bin Ismail
  Chairman
- Dato' Sri Ir. Dr. Judin Abdul Karim
  Director
- Tan Sri Dato' Seri Dr. Salleh Bin Mohd Nor
  Director
- Dato' Prof. Dr. Rujhan Bin Mustafa
  Director
- Dato' Ahmad Shukri Bin Hj. Tajuddin
  Director
- Prof. Madya Ts. Dr. Ramzah Dambul
  Director
- Dr. Rezal Khairi bin Ahmad
  Director

Company Secretary:

- Puan Shahrizat binti Othman
  AAJ Management Services Sdn Bhd

Registered Office:

- NanoMalaysia Berhad (955265-P)
  Suite C-5-4, Wisma Goshen
  Plaza Pantai, Jalan Pantai Bharu
  59200 Kuala Lumpur

Official Address:

- A-2-2 & A-2-3, Level 2,
  157 Hampshire Place Office,
  No. 1 Jalan Mayang Sari,
  50450 Kuala Lumpur

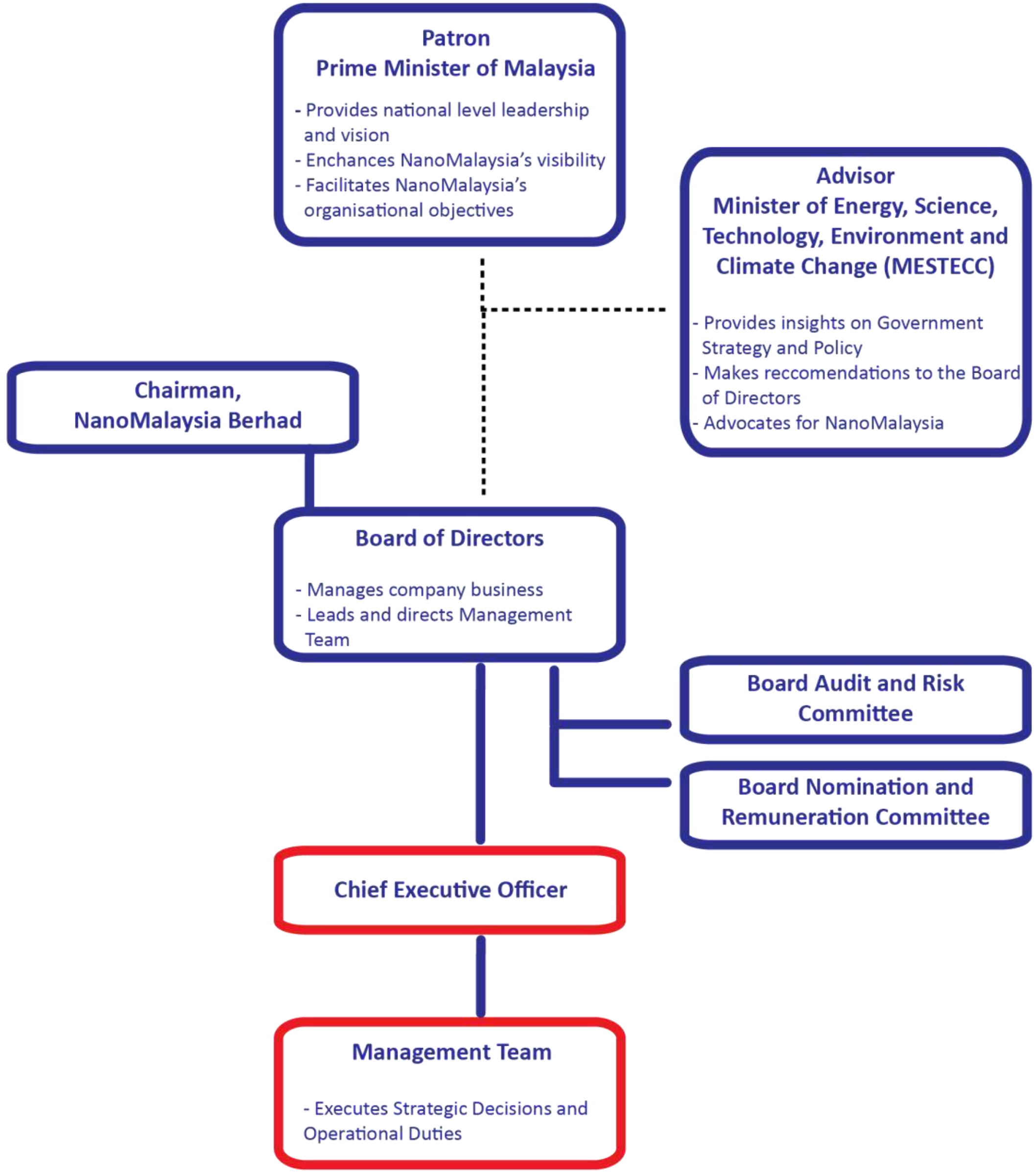
Website:

- www.nanomalaysia.com.my

Auditors:

- A Razak & Co

GOVERNANCE STRUCTURE



CORPORATE STRUCTURE

NANOMALAYSIA®

NanoMalaysia Berhad
- Holding company

Nanovation Ventures Sdn Bhd
- Investment facilitation company

NanoVation

Nano Commerce Sdn Bhd
- Business and commercial company

NANOCOMMERCE

NanoVerify Sdn Bhd
- Consultation and verification company

NANO Verify

Infusion Materials Lab Sdn Bhd
Shareholding : 100% equity

IML INFUSION MATERIALS LABS

NanoTextile Sdn Bhd
Shareholding : 30% equity

NANOTEXTILE

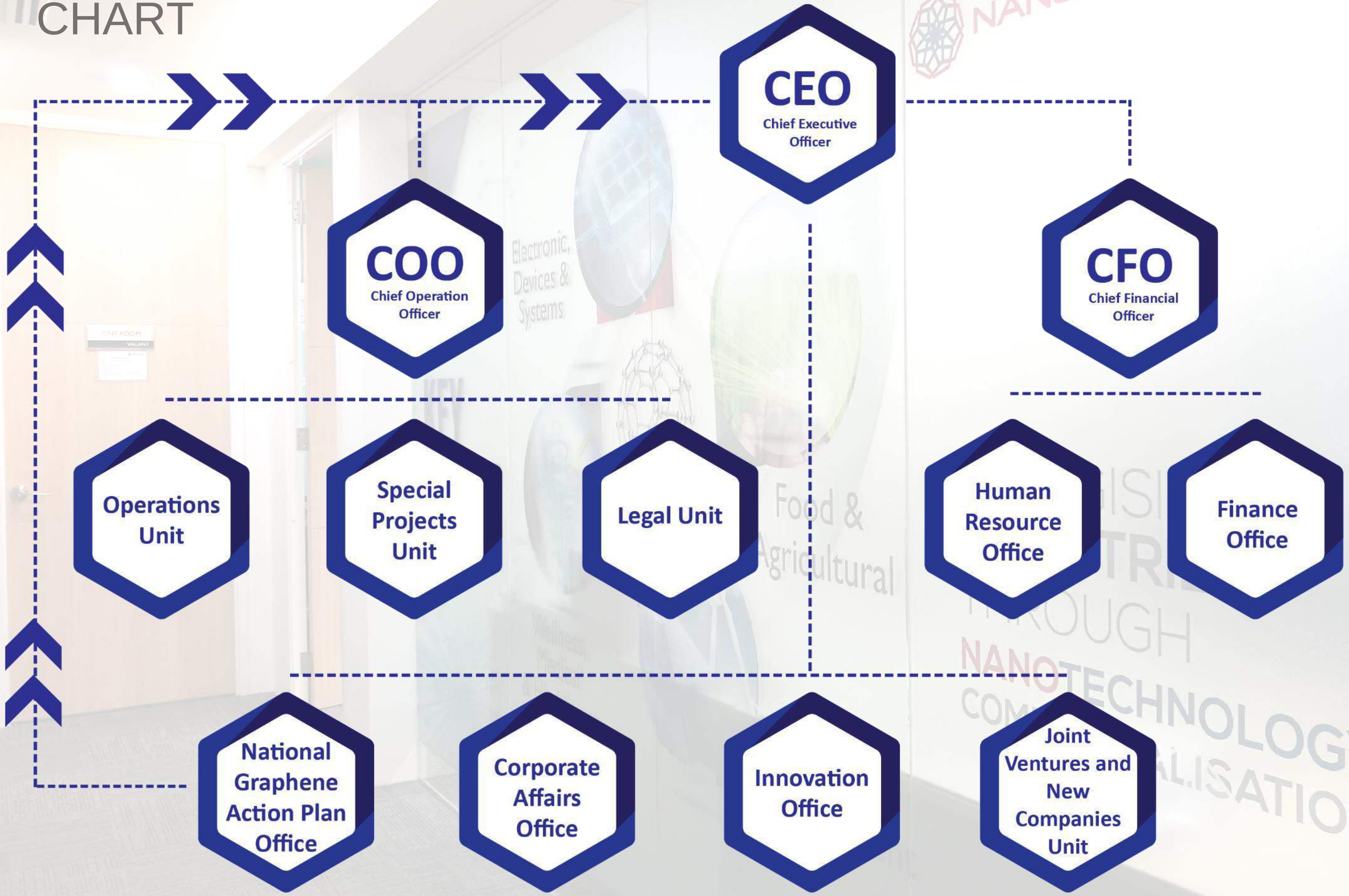
NanoQuartz Sdn Bhd
Shareholding : 100% equity

NanoQuartz

MNA Energy Sdn Bhd
Shareholding : 29% equity

MNA ENERGY

ORGANISATIONAL CHART



BOARD MEMBERS

PROFESSOR EMERITUS DATO' IR. DR. MOHAMAD ZAWAWI BIN ISMAIL
CHAIRMAN

Dr. Zawawi became Chairman of the board on 25 Nov 2011. He was the founding Vice Chancellor of Universiti Malaysia Sarawak, UNIMAS, the Dean of Engineering, and Deputy Vice-Chancellor of Universiti Kebangsaan Malaysia (UKM) and also the Founding Director of Commerce Leadership Institute of CIMB Group, and one of the founders of Mimos Berhad. Dr. Zawawi had once served the Board of Malaysia Qualifications Agency MQA, Chairman of the Higher Education APEX Committee, Board Member of International Medical University, Board Member of National Defence University, Board Member of Razak School of Government, Chairman of Universiti Sains Malaysia and Chairman of Universiti Kebangsaan Malaysia. He had served several national bodies including National Information Technology Council, National Aerospace Council, National Scientific Research and Development Council, and National Higher Education Council. He was once advisor to both the National Science Centre and National Planetarium. Dr. Zawawi gained both his bachelor and doctorate degrees from the University of Leeds. He is a Foundation Fellow of the Academy of Sciences Malaysia, a Member of the Institute of Engineers Malaysia, and an Honorary Fellow of The Institute of Physics Malaysia for which he once served as its President (1976-79).

Dr. Rujhan is a Board Director since 25 November 2011. He is also the Chairman of Board Nomination and Remuneration Committee. Dr. Rujhan received his Ph.D. and Masters Degree in International Economics from Ritsumeikan University, Japan. He is a Council Member of the Malaysian Qualifications Agency and The National Council for Science and Research. He is currently the Chief Executive Officer of Education Malaysia Global Services (EMGS) and the Chief Executive Officer, Education Performance and Delivery Unit.

DATO' PROFESSOR DR. RUJHAN BIN MUSTAFA
CHAIRMAN OF BOARD NOMINATION AND REMUNERATION COMMITTEE

BOARD MEMBERS

Dr. Judin is a Board Director since 25 November 2011. He received his Masters of Science in Structural Engineering and PhD. in Civil Engineering from the University of Southern California. A former Director General of the Public Works Department, Dr. Judin is a Fellow of IStructE, United Kingdom, a Fellow of the Institution of Engineers Malaysia (IEM), and Fellow of Academy of Sciences Malaysia. He is also the President of Board of Engineers Malaysia (BEM) and the Chairman of the World Road Association (PIARC) for Technological Exchanges and Development Commission. Dr. Judin is currently the Chairman of CIDB Holdings Sdn Bh.

DATO' SRI IR. DR. JUDIN ABDUL KARIM

DATO' AHMAD SHUKRI BIN HJ. TAJUDDIN

MEMBER OF BOARD AUDIT COMMITTEE

š } [Ahmad Shukri is a Board Director since 25 November 2011 and a member of the Board Audit Committee. He has over 25 Ç Œ • [experience in various capacities in the private and government sector and has accumulated vast experience in property, construction, business and technology development. š } [Ahmad Shukri is an Advisory Panel Member on Innovation to Malaysian National Productivity and was Technical Advisor and Head of Study Team, Government of Zambia for the setting up of Industrial Park in Zambia. He obtained his MBA from Greenwich University, Australia and is currently the Chief Executive Officer (CEO) and member of board of Senai Hi-Tech Park. He was also the former CEO an member of board of Kulim Hi-Tech Park.

TAN SRI DATO' SERI DR. SALLEH BIN MOHD NOR

MEMBER OF BOARD AUDIT COMMITTE

Dr. Salleh is a Board Director since 25 November 2011 and a member of the Board Audit Committee. A respected conservationist and academician, Dr. Salleh has played a major role in the protection of the Malaysian environment and the conservation of nature and natural resources, particularly via his position as the First Director-General of the Forest Institute of Malaysia (FRIM) and the President of Malaysian Nature Society (MNS). A Merdeka Award recepient and one of the 50 ^Tokoh D o Ç a] award winners, Dr. Salleh received his PhD. and Masters Degree from Michigan State University. Dr. Salleh chairs the Antarctica Task Force and has visited Antarctica twice and is currently the Pro-Chancellor of Universiti Teknologi Malaysia.

BOARD MEMBERS

PROF. MADYA TS. DR. RAMZAH DAMBUL

0 (6 7 (& & µ 6 REPRESENTATIVE

Dr. Ramzah is the Deputy Secretary General (Science, Technology & Industry) of the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC). He received his Ph.D. in Climatology from the University of East Anglia in 2007. His niche areas include long-term prediction, seasonal monsoon forecasting and the relationship between large-scale air circulation and local climate. Dr. Ramzah is a certified consultant under the Energy Information Administration (Climate Change, Land Use) and has received many international recognitions in the academic field such as the Chevening Fellowship in 2008. He was appointed as a Research Fellow at the Centre for Climate Change Research, King Abdul Aziz University, Jeddah from 2012 to 2014 and has received many international and local research and innovation awards since 2008 and has been involved in 18 academic publications so far. Dr. Ramzah is a Board Director since 11 May 2016.

DR. REZAL KHAIRI AHMAD

Dr. Rezal was appointed as the Chief Executive Officer of NanoMalaysia in January 2013 and is a Board Member since 16 July 2014. He serves as Chairman of Advanced Materials Investment Advisory Panel Working Group under Malaysian Investment Development Authority (MIDA), Treasurer for Asia Nano Forum (ANF) and Chairman of Commercialisation Working Group under Asia Nano Forum. In September 2017, he was appointed as International Advisor to China 'Œ ‰Z v /v µ•šŒÇ oo] v ~ '/ • o]v]vP D o Ç•] [• E š]}v o 'Œ ‰Z v š]}v Wo v îìîì (NGAP2020) and mutual economic benefits. Dr Rezal holds a Ph.D. in Nanotechnology, Electronic/Electrical Engineering from London Centre for Nanotechnology, University College London as the first Khazanah PhD Scholar from 2007 to 2010 with publications in high impact journals.

MANAGEMENT TEAM

Dr. Rezal was appointed as the Chief Executive Officer of NanoMalaysia in January 2013. Dr Rezal holds a Ph.D. in Nanotechnology, Electronic/Electrical Engineering from London Centre for Nanotechnology, University College London as the first Khazanah Ph.D. Scholar. As E v } D o Ç•]• [• first employee, he crafted the company structure and developed the business model and corporate positioning strategy relative to like-minded government agencies and relevant industries. Between August 2012 and February 2013, Dr Rezal also served as Acting Under Secretary of National Nanotechnology Directorate, Ministry of Science, Technology and Innovation (MOSTI). From June 2012 to May 2014, he came under secondment from Khazanah Nasional, an investment arm of the Government of Malaysia. Prior to that, he was a Manager at GENSS Sdn Bhd. and Business Development Manager in a local ICT private company from 2000 to 2001.

DR. REZAL KHAIRI AHMAD
CHIEF EXECUTIVE OFFICER

ANASNUDIN HJ. ABDULLAH
CHIEF FINANCIAL OFFICER

Mr Anasnudin was appointed as Chief Financial Officer of NanoMalaysia in June 2012. He holds a combined studies degree in Accounting from De Montfort University, Leicester, United Kingdom and an Advanced Diploma from the Chartered Institute of Management Accountants (CIMA), United Kingdom. Prior to his appointment to NanoMalaysia, Mr Anasnudin was appointed as the Financial Controller with a Class A construction company in Kuala Lumpur and later as a Finance Manager at Cramin Sdn Bhd. In 2010, he was the Chief Financial Officer, and led to the setting up of UKM Technology Sdn Bhd. - a wholly-owned technology transfer company of Universiti Kebangsaan Malaysia (UKM).

MANAGEMENT TEAM

MOHAMAD HAFIZ BIN ZOLKIPLI
CHIEF OPERATION OFFICER

Mr. Hafiz was appointed as Chief Operation Officer in August 2018. He joined NanoMalaysia as the Senior Vice President, Operations, in 2016. Prior to joining NanoMalaysia, he was with Petroliam Nasional Berhad (PETRONAS) where he served as Head of Business Process Advisory and Solutions in the Malaysia Petroleum Management division and Head of Risk Planning and Governance in the Project Delivery and Technology division. He has also worked in various manufacturing and business processes functions across a wide range of industries; from manufacturing at Western Digital and Flextronics as a process engineer, to banking at CIMB Group as Manager of Business Process Engineering. Mr. Hafiz is a certified Lean and Six Sigma practitioner and has completed a wide range of process improvement activities and reengineering projects within Malaysia and abroad. He obtained his Bachelor of Mechanical Engineering from University College London, United Kingdom.

DR. DANIEL BIEN CHIA SHENG
VICE PRESIDENT, INNOVATION OFFICE

Dr. Daniel was appointed as Vice President, Innovation Office in March 2015. He was previously with MIMOS Berhad, as the Head of Nanoelectronics Centre of Excellence, where he focused in driving the National Nanoelectronics Roadmap. Prior to that, Dr. Daniel was the R&D Specialist at Philips Lumileds Lighting Company Sdn Bhd, overseeing all developments of silicon based LED products in Malaysia. He has chaired the National Mirror Committee for the International Electrotechnical Committee, IEC-TC113 on Nanotechnology Standardisation for Electrical and Electronic Product and Systems for Malaysia from 2010 to 2015 and has filed more than 50 international patents and technical publications respectively. Dr. Daniel has a Ph.D in Electrical and Electronics Engineering from Queen's University, Belfast, United Kingdom.

MANAGEMENT TEAM

With more than 10 years' experience in the field of Business Development and Marketing, Ms Murni is currently heading the National Graphene Action Plan 2020 Office since 2015. She started her career with Pharmaniaga and brings with her diverse experience in operations and managerial functions in business development and marketing. She holds an MBA in International Business from the University of East London and she has been involved in various business-development disciplines showing expertise in engaging with decision makers and devising winning sales strategies and solutions exercises. Ms Murni brings a deep understanding of the business-technology interface and the capacity to identify and align clients' emerging technology needs with products and services.

MURNI ALI
VICE PRESIDENT, NATIONAL GRAPHENE ACTION PLAN

RAJA RIZNAL RAJA ABIDIN
VICE PRESIDENT, CORPORATE AFFAIRS OFFICE

Raja Riznal joined NanoMalaysia in March 2018 as Vice President, Corporate Affairs Office. Previously he started up Allworks Distribution Sdn Bhd and Futsalworks Sdn Bhd, where he managed all matters related to communications, branding, sales as well as the creative designs for the companies. He was also with DISITU Holdings where he assisted in setting up Odyssey Prestige Coaches and Compass Coaches. From 2000 to 2005, Raja Riznal was at PETROSAINS Sdn Bhd, where he has developed, coordinated and implemented marketing, branding and communication strategies and initiatives of PETROSAINS. He has also coordinated external and internal events, activities and programmes working with the Corporate Affairs Unit (CAU) and the Motorspors Division within PETRONAS to reach out the general public through their F1 and CSR activities. He has a B.A. in Film & Video from the Arts Institute of Bournemouth, United Kingdom.

MANAGEMENT TEAM

HANNAH HO
ASSISTANT VICE PRESIDENT, LEGAL UNIT

Ms. Hannah was appointed as Assistant Vice President, Legal Unit in February 2018. She brings with her over 20 years of corporate in-house legal counsel management and company secretarial practice experience. She started her career in Elf Lubricants (M) Sdn Bhd. before reading in chambers as a pupil at Messrs Cheah, Teh & Su and later Messrs. Scully Yoon. After being called to the Bar, High Court of Malaya in 2002, Ms. Hannah join TOTAL Oil Malaysia Sdn Bhd. She has also served as Legal Counsel for PETRONAS Lubricants International before joining NanoMalaysia. She volunteers as a Director in Hazulan Education Trust, a private charitable trust supporting bright, impoverish students from Bukit Pulau(Penang). Ms. Hannah holds an LL. B (Hons) from the University of Wolverhampton, United Kingdom and is also a Licensed Secretary by the Suruhanjaya Syarikat Malaysia (SSM).

S. FRANCIS XAVIER
ASSISTANT VICE PRESIDENT JOINT VENTURE & NEW COMPANIES

Mr. Francis was appointed as Assistant Vice President, Legal Unit in 2013 was appointed as Assistant Vice President, Joint Venture & New Companies in November 2017. Prior to that, he was with Bank Utama (M) Berhad (later merged with RHB Bank Berhad), where he managed consumer and commercial credit portfolios, including Corporate Planning & Strategic Management. With more than sixteen years of banking experience in both consumer and commercial credit, Mr. Francis brings diversified banking experience to Joint Venture and New Companies t0 support the business development and growth of nanotechnology businesses, particularly in the commercialisation of nanotechnology intellectual property and nanotechnology products through various collaboration models with potential nanotechnology enabled industries, including through joint venture exercise and licensing agreements. He holds the Diploma of Laws from the University of London.

THE NANOTECH INDUSTRY

3

THE GLOBAL NANOTECH INDUSTRY

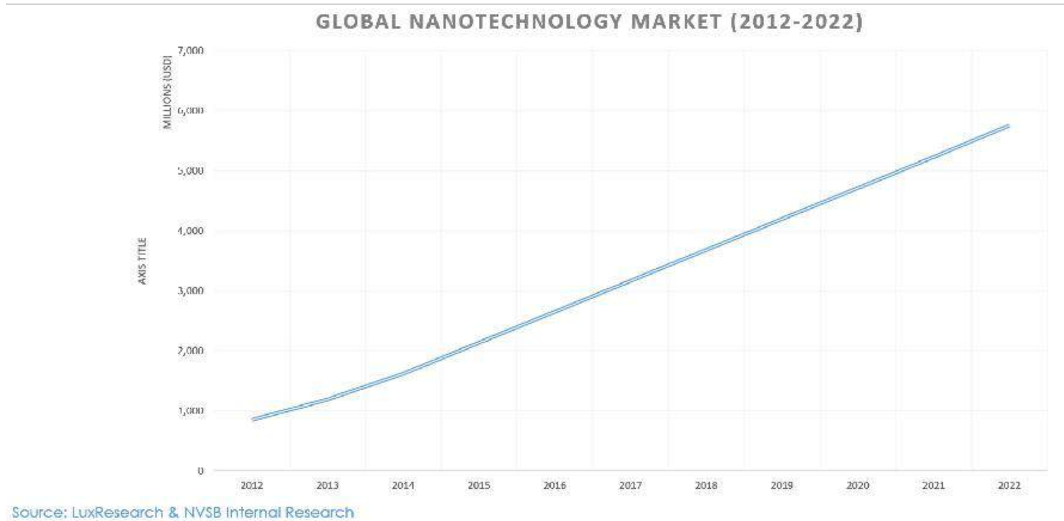
Although relatively new, the global nanotechnology sector will be one of the greatest needle shifting industries within the next five years, with far reaching implications on the way we live, work and play. The international nanotechnology market is expected to hit the USD5.76 trillion mark by 2022, from USD3.68 trillion in 2018, denoting a double-digit Compound Annual Growth Rate (CAGR) of 11.8% within the forecast period of 2018 till 2024[1].

Europe and Asia are expected to register the greatest growth in market share, followed closely by the United States. •] [• market share is expected to grow from USD1.3 trillion in 2018, to USD2 trillion in 2022, while µ Œ } % [• market share is forecasted to increase from USD1.33 trillion in 2018, to USD2 trillion in 2022[2].

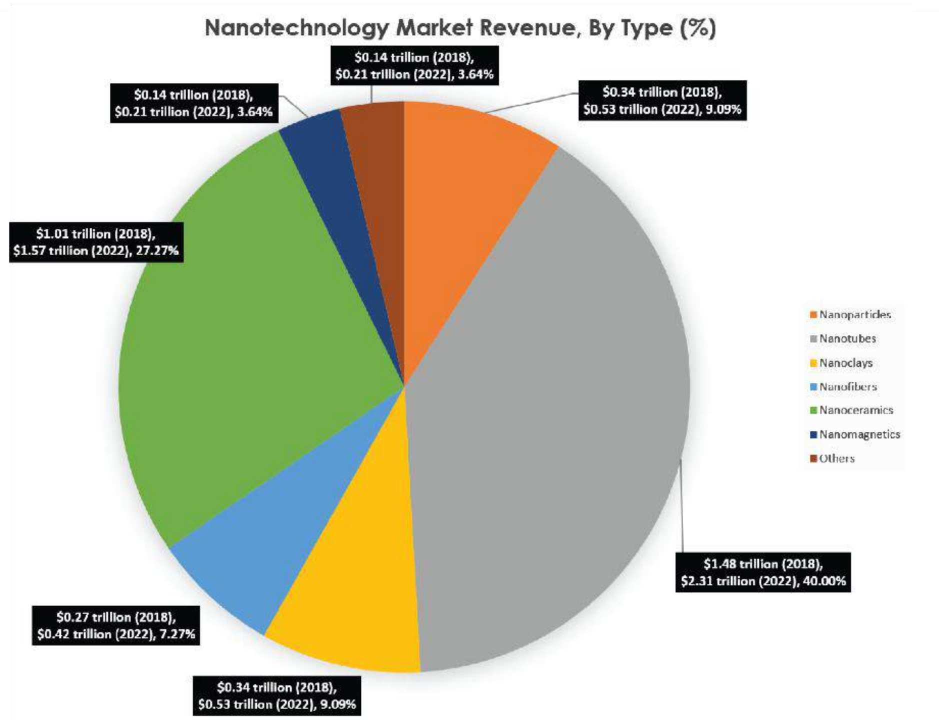
The explosive growth in nanotechnology will primarily be driven by rapidly growing advancements in potential applications within sectors such as healthcare, cosmetics, energy and agriculture. Significant developments have been observed within the past few years in the electronics, energy and biomedical sectors.

Specifically, it has been projected that nanotubes will capture the greatest market share, with demand driven by the electronics, energy storage and automotive sectors. The second highest market share is expected to be held by nanoceramics, with growing demand from the electronics and biomedical sectors. Over 70% of the global nanotechnology market share will be held by nanotechnology applications within materials and manufacturing, electronics and information technology, and healthcare and life sciences.

1. Source: LuxResearch & NVSB Internal Research
2. Source: LuxResearch & NVSB Internal Research



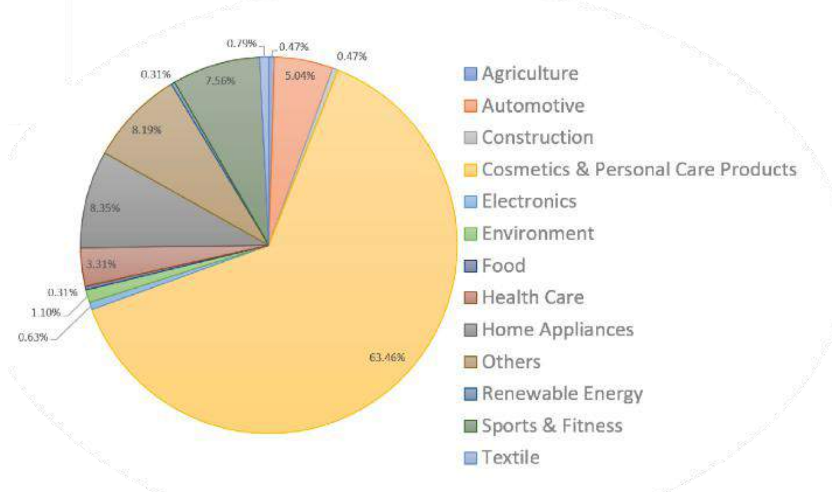
Source: LuxResearch & NVSB Internal Research



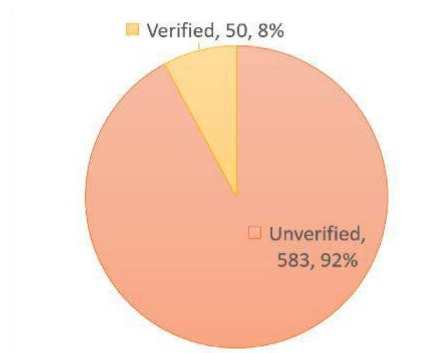
MALAYSIAN NANOTECHNOLOGY LANDSCAPE

To capture greater market share, industry players globally are expected to invest significantly in research and development (R&D) activities, to cater to the rising demand for nanotechnology based devices and equipment. Challenges exist in the form of the high cost of nano based devices This could potentially hamper the growth of Small and Medium Enterprises (SMEs) which may not have the funds or specialised skills to venture into this space, unless they are given the required support to do so. As well as that, there is a lack of skilled professionals in this field, and more efforts will need to be expended towards building sectoral human resource capacities

Products Distribution by Sector



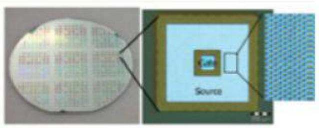
Number of Verified Products Vs Unverified Products



EMERGING APPLICATIONS

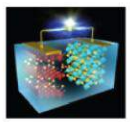
Next-generation Power Semiconductors

Accelerated development has increased in wide-gap semiconductor substrates and devices using Silicon Carbide (SiC) or Gallium Nitride (GaN) aimed at early implementation.



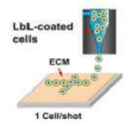
Next-generation Electricity Storage Devices

Heightened anticipation for next generation high performance batteries, such as all-solid-state, multivalent cation, metal-air, and Lithium-Sulphur (Li-S) batteries.



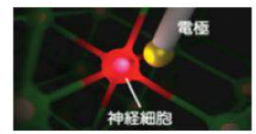
Bio-fabrication

The emergence of 3D bio-printing for freely arranging biomaterials and cells paves the way for applications in constructing tissues and organs, discovery of new drugs, and regenerative medicine.



Neuroimaging

Remarkable advances in technologies to electrically or optically measure brain activity has led to the development of elucidating mechanisms for deciphering brain functions and data processing.

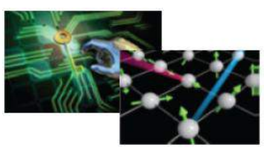


IoT enabled Artificial Intelligence (AI) devices

Hugely anticipated arrival of an IoT Smart Society based on AI and Deep Learning technologies.

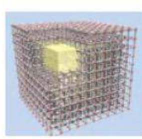
Quantum Computing

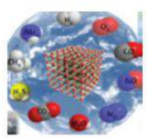
Super-fast computations through quantum mechanics and quantum gate and quantum annealing systems are expected to have applications in AI.



Porous Frameworks (PCP, MOF and COF)

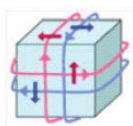
These compounds have controllable nanospaces that could be used for highly selective adsorption/desorption fields, electronic/ionic conductivity, and specific reactions.





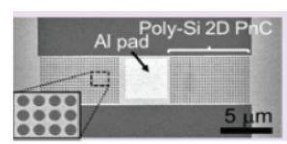
Topological Insulators

A candidate for next-generation electronic devices, exhibiting a unique metallic state at its boundaries (surface in 3D and edge in 2D systems) but not its interior (insulator), and supplies non-dissipative current.



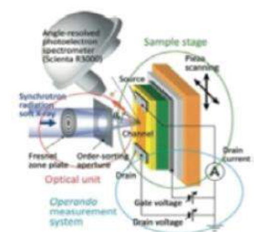
Phonon Engineering

More focused research on the creation of new materials and devices that treats heat at the nanoscale as phonons and controls heat at origin.



Operando Measurements

There is much interest in the development of operando measurements ranging from materials to organisms.



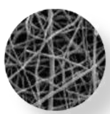
Source: CRDS 2017

NANOMALAYSIA PROGRAMMES

4

FOCUSING ON 4 KEY STRATEGIC JUMPSTART SECTORS

Food and Agricultural



Nanofiber, Nanocellulose (Forestry Nanotechnology, Filtration system)

Food processing and management (smart packaging)

Nanofertiliser (Bio-active ingredient detection and database)

Wellness, Medical and Healthcare

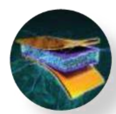
Drug delivery (Nanomedicine, biosensors)

Packaging and systems (Nanonetworks for healthcare applications, RFID)

Antimicrobial applications (Antimicrobial assays)

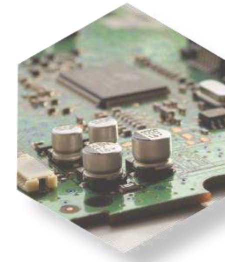
Energy and Environment

Li-ion battery anode / ultra-capacitors (Power system)



Advanced materials (Nanogenerators, Nanochip)

Green energy and power technology (Sensors for alternative power sources)



Electronic Devices and Systens

Nanosensors (Scalar sensors & system)

Nanoelectronics (Processors, NEMS)

Nanodevices (Phones, cameras etc.)

NANOMALAYSIA RMK -11 PROGRAMMES

NanoMalaysia has in place a number of programmes which form the thrust of our strategy to drive the growth of the Malaysian nanotechnology sector. In our bid to re-energise industries through nanotechnology commercialisation, we have identified four key strategic sectors which present the greatest growth opportunities in the medium to long-term. These sectors are Electronic Devices and Systems, Food and Agriculture, Energy and Environment, and Wellness, Medical and Healthcare.

Our programmes are the National Graphene Action Plan 2020 (NGAP2020), and the Advanced Materials Industrialisation Programme. NGAP2020 is a commercialisation programme which focuses on graphene applications in five identified areas, namely, lithium-ion battery anodes/ultracapacitors, conducive links, rubber additives, plastic additives, and nanofluids. The Advanced Materials Industrialisation Programme enables nanotechnology adoption by industry through various focused support services and platforms.

One of our core programmes is iNanovation which supports and empowers Small and Medium Enterprises (SMEs) to establish a foothold in the industry and grow their market share. The primary means by which this is achieved is through the introduction of new nanotechnology enabled processes and materials, to enable the transformational shift from conventional industries to nanotechnology enabled industries.

To ensure that nanotechnology products and applications developed by SMEs in Malaysia adhere to global best practice expectations and requirements, we have collaborated with SIRIM QAS International, and obtained the advisory of Standards Malaysia, to conduct the voluntary nanotechnology certification programme, NANOVerify. Our focused efforts through our various programmes have resulted in a number of key achievements, which have contributed to the growth and expansion of the nascent nanotechnology sector in Malaysia.

NANOMALAYSIA PROGRAMMES SECTORS

Electronic Devices And Systems

The Electronics and Electrical (E&E) industry is one of the major sub-sectors of the manufacturing sector in Malaysia. E&E primarily consists of two main industry components t computer, electronic and optical products, and electrical equipment. An important contributor to the national economy, in 2017 alone, E&E was D o Ç•] [• largest export earner at RM343 billion, accounting for 36.7% of the } µ v š Œ Ç[• total exports.[1]

The added value of the E&E sub-sector stood at RM67.7 billion in 2017, an 8.2% increase from the previous year. The increase in the • š } Œ[• value is attributed to an industry shift from low value-added activities, to high-value operations to enhance the local • š } Œ[• competitiveness within the international business landscape.

Employment within the E&E sector has grown substantially through the years to consist of 19.9% of the total manufacturing workforce comprising of 485,000 workers as at end 2017[2]. Robust global demand for E&E products is driving industry growth, and by 2020, it is expected that the sector will generate a Gross National Income (GNI) impact of RM53.4 billion, and create a further 157,000 jobs[3].

There is tremendous potential for the E&E sector to move up the manufacturing value chain and thus propel its growth by adopting nanotechnology within its manufacturing processes. Opportunities for growth and expansion are fuelled by the advent of new breakthrough discoveries in nanotechnology such as nanoelectronics and nanophotonics, as well as the rise of the Internet of Nano Things (IoNT).

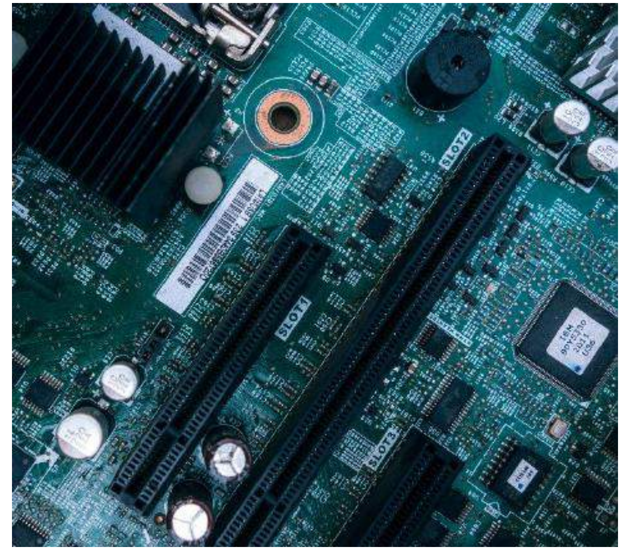
Food and Agriculture

Two main types of agriculture dominate this sector in Malaysia t plantation and food production. Traditionally, plantation agriculture formed the main thrust of D o Ç•] [• economic growth and still remains one of the major contributors to GNI.

In 2017, the agriculture sector contributed RM96.0 billion, or an equivalent of 8.2%, to Gross Domestic Product (GDP.) Of this, oil palm was the largest contributor at 46.6%, followed by other agriculture at 18.6%, livestock at 11.4%, fishing at 10.5%, rubber at 7.3%, and forestry and logging at 5.6% ú

While our plantation production capacities, especially in oil palm exports, remain strong, our food production capacities lag behind our neighbours. Taking into consideration the increasing prevalence of the occurrence of natural disasters such as earthquakes, tsunamis, storms and droughts which are impacting the ‰ o v š •][• ecosystem, food security has become a pressing issue in current times.

Nanobiotechnology could potentially play a critical role in increasing agricultural productivity, boost pest resistance, and improving food quality. The application of nanobiotechnology to agricultural food production can help avert major food crises globally.



1. Source: 25th Productivity Report 2017/2018, published by Malaysia Productivity Corporation in 2018
2. Source: 25th Productivity Report 2017/2018, published by Malaysia Productivity Corporation in 2018
3. 2018 Malaysian American Electronics Industry (MAEI) Survey Report

NANOMALAYSIA PROGRAMMES SECTORS

Energy And Environment

Malaysia is blessed with an abundance of natural energy sources such as solar energy, biomass from plantation agricultural by-products, petroleum and natural gas reserves, as well as tidal wave and wind energy. In line with the need to combat the effects of climate change, the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) has committed to a national target of achieving 20% in renewable energy as the v š] } v[• electricity source by 2030.

To achieve this goal, we need to consider innovative new ways to transfer energy from its source to consumers in the most cost-effective, safe and convenient means. The focus is on generating a higher degree of portability, longer usage periods, higher energy outputs and more sustainable sources of energy supply.

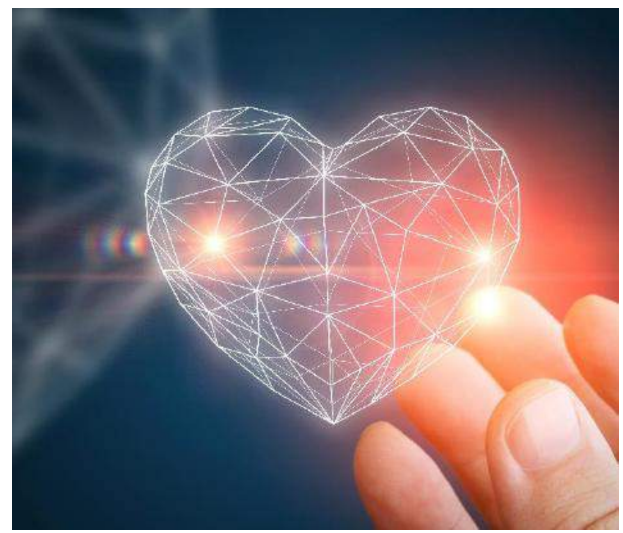
With conventional technology having reached the limits of its energy processing and storage capacity, we are now turning to nanotechnology to boost energy capacities and optimise processes. Nanotechnology can be used to enhance energy efficiency across the board, by embedding state of the art technological solutions to optimise energy production. Using nanotechnology also presents a greener and more sustainable energy solution for the longer term.

Wellness, Medical and Healthcare

In recent years, the wellness, medical and healthcare sector in Malaysia has been one of the most dynamic, recording rapid growth and development, especially within the private healthcare sub-sector. Due to extensive Government support in terms of investment in hospital medical infrastructure, the sector has significantly improved over the past decade. D o Ç •] [• healthcare sector today is on par with developed nations, with highly trained and skilled medical staff, complemented by excellent hospital facilities.

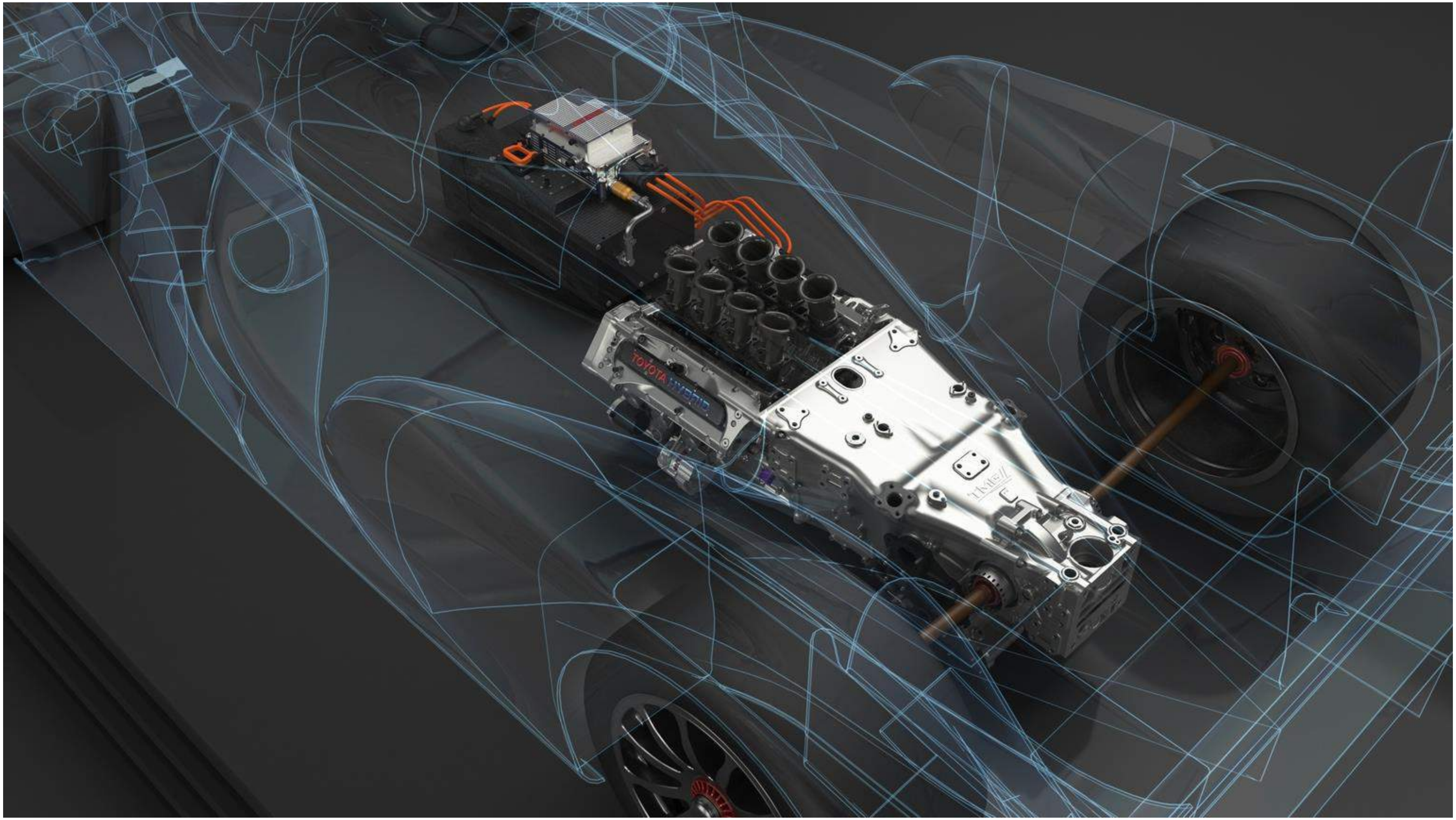
D o Ç •] [• healthcare sector has received international recognition as being among the best in the world, thus creating global awareness of our healthcare • Ç • š u [• strengths. In 2019, Malaysia was ranked first in the Best Healthcare in the World category of the 2019 International Living Annual Global Retirement Index. The previous year, in 2018, the International Medical Travel Journal recognised Malaysia as the Medical Tourism Destination of the Year, the third time it had done so. Consequently, healthcare tourism is booming, with over 920,000 medical tourists arriving in Malaysia for the year 2017/2018, leading to a medical tourism sub-sector value of RM7.4 billion in 2017 û.

Healthcare delivery is transforming on the back of digital healthcare trends as a result of Industry 4.0 applications. The digital healthcare market is estimated to exceed USD379 billion by 2024. Recognising its tremendous growth potential, the Malaysian Government has identified healthcare equipment as one of the focus sectors of the National Policy on Industry 4.0. A clear way forward lies in leveraging on breakthrough nanotechnology products and solutions, especially within areas such as drug delivery systems and anti-cancer treatment.



4. Source: Department of Statistics Malaysia, published on 31 December 2018
5. Source: 25th Productivity Report 2017/2018, published by Malaysia Productivity Corporation in 2018

NATIONAL GRAPHENE ACTION PLAN



NATIONAL GRAPHENE ACTION PLAN

Five Application Areas

NANOMALAYSIA

Role in effecting National Graphene Action Plan

- Awareness Building
- Project Execution
- Scale-up Support
- Cordination and Monitoring

Referred to as the ^Á}v uŒš Œ of the 21st century, graphene is a carbon-based material which is the strongest known material currently. It consists of a lightweight honeycomb sheet of carbon atoms, is almost transparent and flexible, yet highly conductive to heat and electricity. Its properties make it an attractive proposition for nanotechnology applications.

To make the most of the value of graphene, the National Graphene Action Plan 2020 (NGAP 2020) was initiated in July 2014. NGAP 2020 is a commercialisation programme which focuses on graphene applications and high value-add graphene-enabled manufacturing processes with IPs in five key application areas. The end goal is to enable a local graphene ecosystem to accelerate downstream adoption within Malaysian industries. By 2020, NGAP 2020 is estimated to contribute more than RM20 billion in GNI, and add create a further 9,000 jobs.

Within the short-term future, we plan to extend our collaborations under the NGAP 2020 to radio frequency (RF) electronics, rubber additives and conductive ink applications, by helping companies pilot their production lines for these nano products and applications.

WHAT WE HAVE ACHIEVED

1. Building Awareness

As graphene is a relatively new and unknown material, and the nanotechnology industry is in its infancy in Malaysia, creating awareness within the greater ecosystem on the benefits of the commercialisation of graphene nanoproducts is critical to drive sectoral expansion and growth. Most Malaysian SMEs remain unaware of the vast potential graphene holds, and how to leverage on product development within specific niches with tremendous potential.

As the lead agency implementing NGAP 2020, one of E v}D o Ç[• key roles is to conduct continuous outreach efforts with SMEs, in order to generate greater awareness and understanding on P Œ ‰ Z v [• potential applications. We have also been facilitating partnerships and collaborations between various stakeholders in the ecosystem. These include promoting synergies between industry and academic, and between upstream and downstream producers.

2. Project Execution

E v}D o Ç[• focus on effectively executing projects identified with high growth potential has resulted in quantifiable outcomes which support our progress in this space. Our services are related to assisting companies in the later stages of R&D and prototyping projects, to support companies, partnerships and joint ventures that explore potential graphene-enabled applications.

Total Number of Commercialisations As At End 2018

‡ 3 Companies

Projects Conducted within Application Areas

‡ Lithium-ion battery anodes/ ultracapacitors t 7 projects
‡ Conductive Inks t 4 projects
‡ Rubber Additives t 7 Projects
‡ Plastics Additives t 10 Projects
‡ Nanofluids t 9 Projects

Plastics Additives

Company:

- PROTON
- Compounding & Coloring Sdn Bhd

Graphene-enhanced automotive component applications

Benefits:
Lightweight graphene-based materials for enhanced structural applications and improved fuel efficiency without compromising safety. Increased recyclability and reduced plastic contribution

Rubber Additives

Company:

- Goodway Integrated Industries Berhad (GIIB)
- GB Sekhar Sdn. Bhd

Graphene-enhanced technical compounds, retreading and tire compounds

Benefits:
Lower rolling resistance to reduce energy loss and improve fuel efficiency.
Increases grip.
Reduces wear and increases lifespan of the tire – environmental sustainability

NanoFluids

Company:

- Scomi Chemicals Sdn Bhd

Graphene-based lubricant additive for automotive

Benefits:
Reduced engine friction improves fuel efficiency and lowers emissions

Company:

- ACME Chemicals Sdn Bhd

Graphene-based drilling oil and spilled oil recovery kit

Benefits:
- Reduced cake out of pores due to drilling fluids and improves well productivity
- High sorption capacity in oil spill kits to increase recovery of spilled oil and improved recyclability of kit

Lithium-Ion Battery & Ultracapacitors

Company:

- Scomi Engineering Berhad

Pilot project of Graphene-SCAP Traction Energy Storage System

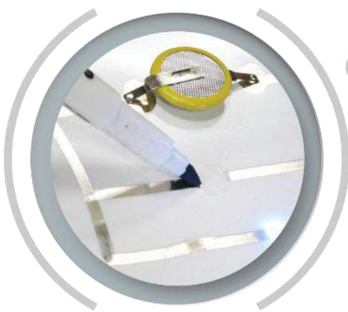
Benefits:
- Lower construction cost by eliminating electrified rail
- Fast charge and discharge

Company:

- MNA Research Sdn Bhd

Production of Backup Storage Graphene-Based Quantum Cell (BSGQC)

Benefits:
- Fast charging
- High capacity energy storage for off-grid infrastructures



Conductive Inks

Company:

- Penchem Technologies Sdn. Bhd

Graphene-based conductive inks for printed circuit board

Benefits:
- Graphene-based conductive i ink reduces resistance by a factor of 10 – enablin energy efficient circuitry and devices

Company:

- Q-DOS Flexcircuits Sdn. Bhd

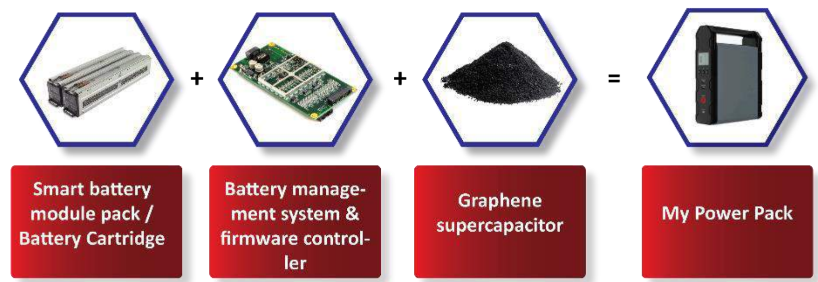
Graphene-based printed flexible circuit or electronic application

Benefits:
- More robust tolerance to bending stresses
- Lower material cost compared to using silver-based conductive inks

APPLICATION: LITHIUM-ION BATTERY ANODES / ULTRACAPACITORS
COMPANY: MNA RESEARCH SDN BHD

Recent developments in the field of energy storage materials are paving the way towards more sustainable solutions to overcome challenges related to energy density and storage. The ever increasing demand for next generation portable and miniaturised electronic devices has resulted in greater efforts expended in exploring nanoscale and lightweight energy storage devices. Under the NGAP2020 initiative, NanoMalaysia is supporting MNA Research Sdn Bhd in its development of a graphene based quantum cell, My Power Pack. My Power Pack can be used as a backup storage application, and is aligned with the Malaysian '}À Œvu v• policy on renewable and efficient energy systems.

Compared to conventional solutions used for solar, telco tower and emergency power supply applications, My Power Pack provides a more energy efficient and environmental friendly means of power supply. It is long lasting and can withstand extreme temperatures, both features which make is an attractive product.

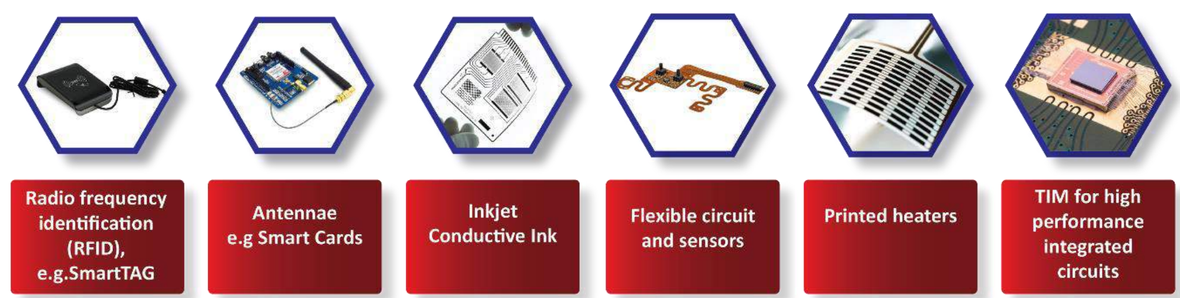


COMPONENTS OF MY POWER PACK

APPLICATION: CONDUCTIVE INKS
COMPANY: PENCHEM TECHNOLOGIES SDN BHD

Penchem Technologies Sdn Bhd designs, manufactures and supplies advanced polymers and composite materials to the electronic and medical industries. The }u‰ vÇ[• current business focus is on LEDs in the form of epoxy and silicone encapsulants and thermal interface materials (TIM); fiber optics in terms of ultraviolet (UV) and heat curable adhesives; and photovoltaics in the form of silicone coatings and conductive interconnects.

NanoMalaysia has assisted Penchem under the auspices of the NGAP2020 initiative to successfully develop graphene based conductive inks for flexible circuits.



APPLICATION FOR GRAPHENE-BASED CONDUCTIVE INKS

APPLICATION: RUBBER ADDITIVES
COMPANY: BONRIC SDN BHD

Bonric Sdn Bhd is a global pioneer in the manufacturing of latex and nitrile cleanroom gloves and medical consumables The company was established in 1990, and has since expanded its market presence to span 15 countries

Under the NGAP2020 initiative, NanoMalaysia worked with Bonric on a project focusing on graphene dispersion in latex for cleanroom gloves which has resulted in significant improvements in tensile strength.

Higher tensile strength

Improve electrostatic discharge between glove and surface

Higher barrier integrity and thinness of glove

IMPROVED TENSILE STRENGTH OF LATEX

APPLICATION: NANOFLUIDS
COMPANY: SCOMI CHEMICALS SDN BHD

Scomi Chemicals Sdn Bhd is involved in the processing, distributing, and trading in chemical products like inhibitors and demulsifier chemicals, and oil and gas production chemicals Under the NGAP2020 initiative, NanoMalaysia was been working with Scomi Chemicals to develop a graphene enhanced transformer oil for the power generation industry.

Utilising the technology, graphene will be dispersed in the transformer oil at certain loading parameters to produce additive for lubricants

Greater thermal conductivity

Heat stability

Optimum dynamic stability

BENEFITS OF GRAPHENE ENHANCED TRANSFORMER OIL

WHAT WE HAVE ACHIEVED

3. ScaleUp Support

E v}D o Çrole [n• providing scaleup support comes into effect at the product commercialisationstage We providecompaniesidentified with the supportthey require to build up production scalefacilities NanoMalaysiaalso facilitates synergistic partnerships between relevant Government agencies and industry players, whereby businessentities are able to accessavailableresources;tax incentivesand Entry Point Projectsto support them in the scaleup.

4. Coordination& Monitoring

NanoMalaysiais responsiblefor tracking and monitoring the progress and development of each of the five application areas identified. This process is done by diligently tracking the progressof the project, especially when public funds are utilised for R&D and scaleup purposes We also look into the potential impactsof the project, especially in terms of GNI contribution, investmentsandjob creation.

National Graphene Action Plan 2020 Review

In March 2018, NanoMalaysiaappointed LuxResearchto conduct a mid-term review of our progresson NGAP2020. By analyzingthe global graphene market landscape,Lux found that graphene had faced considerablehype, and that commercialisationhas been much more challengingthan expected Lux identified 30 proposed graphene applications,and the top five applicationscritical to drive economic growth through grapheneinnovation Luxanalysedthe commercialfeasibilityof these applications,and its fit with D o Ç•public andprivate ecosystem.

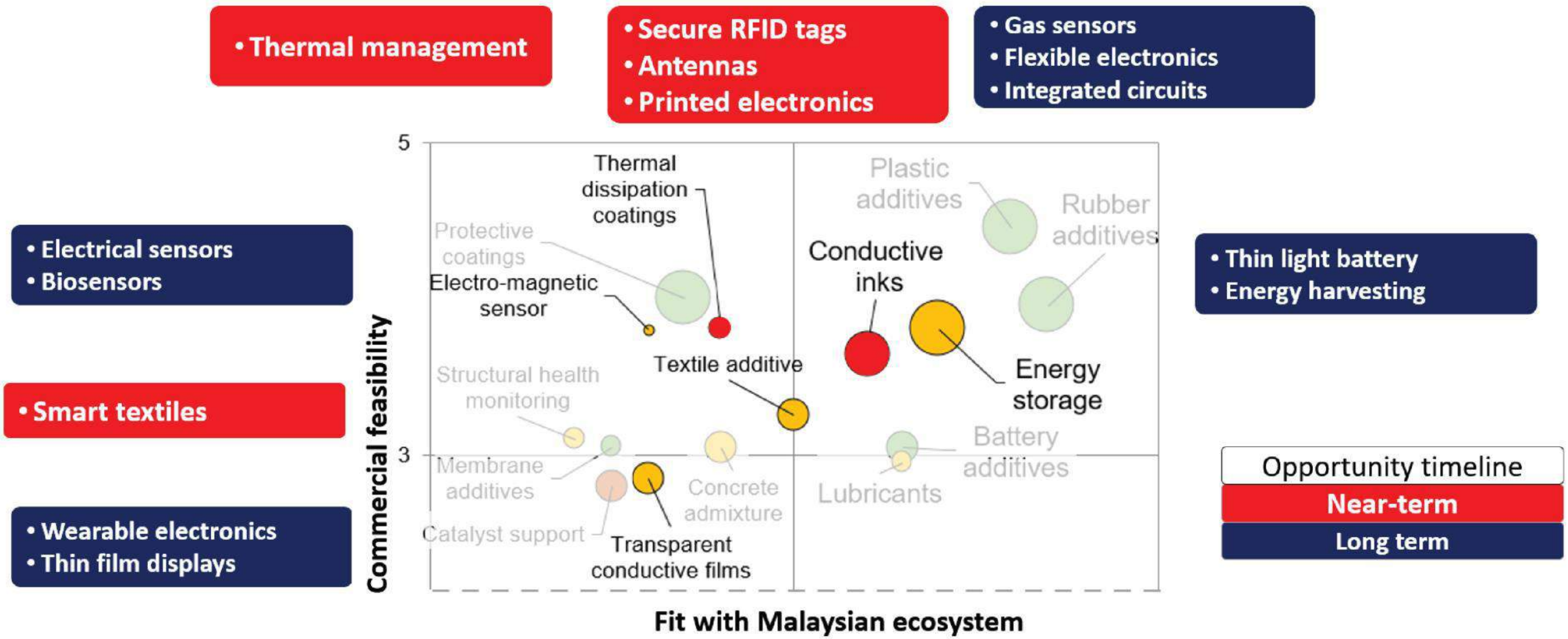
As a result of the review, Lux confirmed the following national priorities with regards to NGAP2020 applications

- ‡ Plasticadditives,especiallyin composites,havea strong developercommunity,and fit with D o Ç• [• aerospacecompositeexpertise
- ‡ Rubberadditivescanenhanceperformancein particularfor higher-valuerubber products,whichis a key strategicpriority for Malaysia
- ‡ Energystorageis a large,longer-term opportunity, which alignswell with D o Ç•strong road and rail transportationindustries
- ‡ Conductiveinksfor high-value devicesgive stronginroadsto IoT
- ‡ Lubricantsconnectswith D o Ç•stronglocaloil andgasindustry

The review also found that Malaysiais well positionedto build graphenemanufacturingcapabilityand to capitalise on P Œ ‰ Z recent commercial uptick. ' Œ ‰ Z biggest commercial bottlenecks are manufacturingchallenges The review recommendedthat NanoMalaysiafocus our near-term efforts on solidifying D o Ç•position in the graphenevalue chain by targeting applicationswith clear commercial feasibility and strong fit with the Malaysianecosystem With effective the NGAP2020 execution,Malaysia had the capacityto build critical expertiseneededin globalgraphenesupplychainmanagementand quality control.

Grapheneoffers multiple inroads to building differentiated applicationsin consumerand industrial IoT markets,yet these applicationsare critically dependenton high graphenequality and cost-reductions By building a strong supplier network for high-quality grapheneand developingexpertise in handling and manufacturinggraphene,Malaysiais well-positionedto capitalise on IoT.

Graphene gives Malaysia multiple avenues to develop use cases in IoT and 4 IR



Malaysia has the right elements in place to develop a graphene-enhanced composites center of excellence

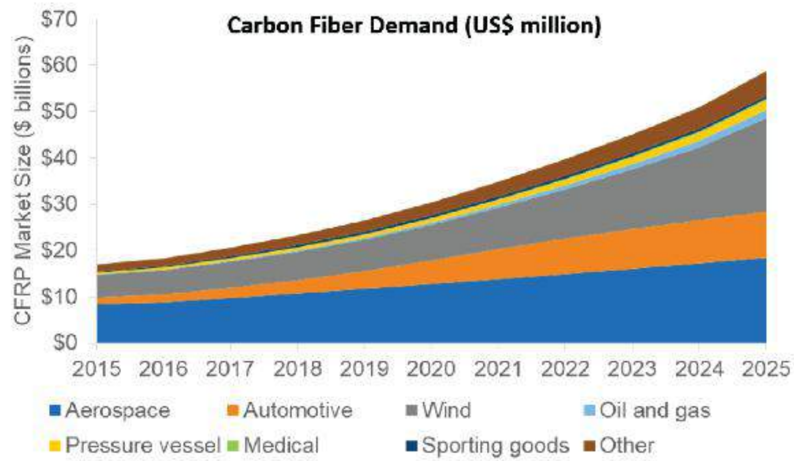
	GNI impact	Job creation	Malaysia's government role
Plastic additives	**RM 1,450 million**	**650 jobs**	**Attract graphene developers targeting aerospace composites**

Hexcel, Boeing expand Aerospace Composites Malaysia facility

Composites World, November 2013

Spirit AeroSystems to expand Malaysia Facility, Hire Additional Workers

Aviation Week, June 2017

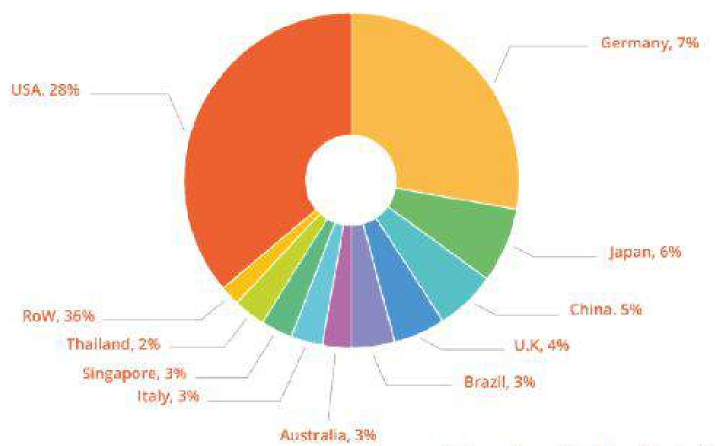


Source: Lux Research Carbon Fiber Update 2017

Malaysia's focus on higher-value rubber products is very well aligned with the performance benefits of graphene

	GNI impact	Job creation	Malaysia's government role
Rubber Additives	**RM 2900 million**	**2000 jobs**	Connect industry to **high-quality graphene master-batch** supply

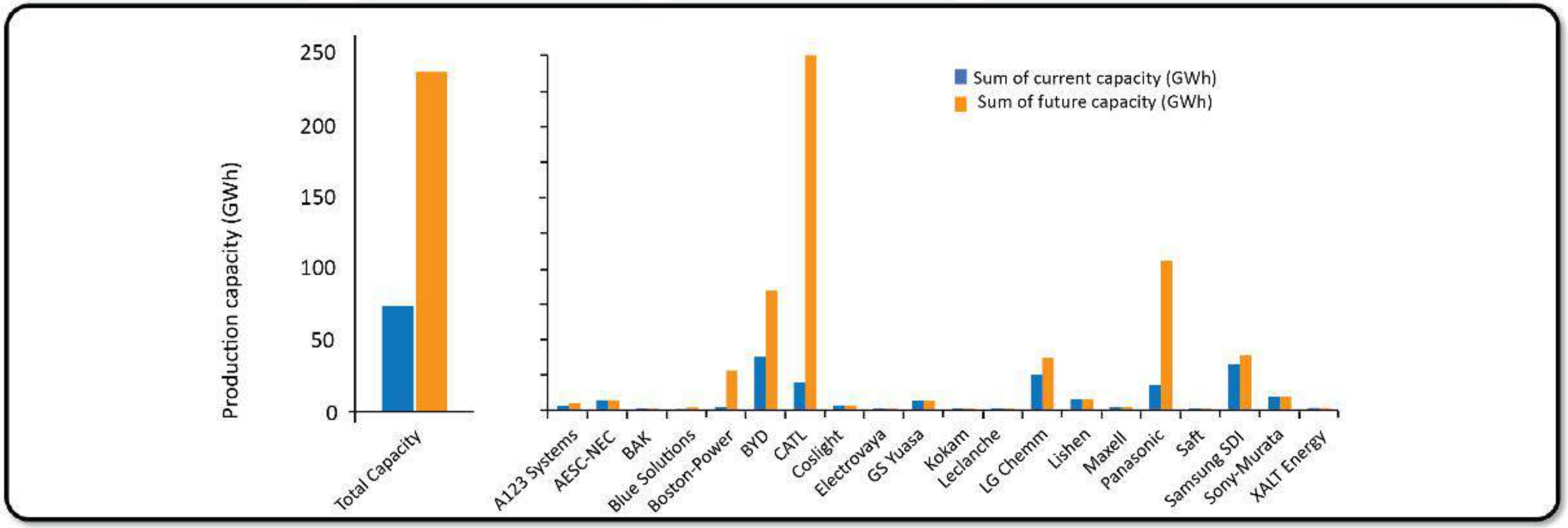
Battery production capacity: current and announced for 2020



Source: International Rubber Study Group

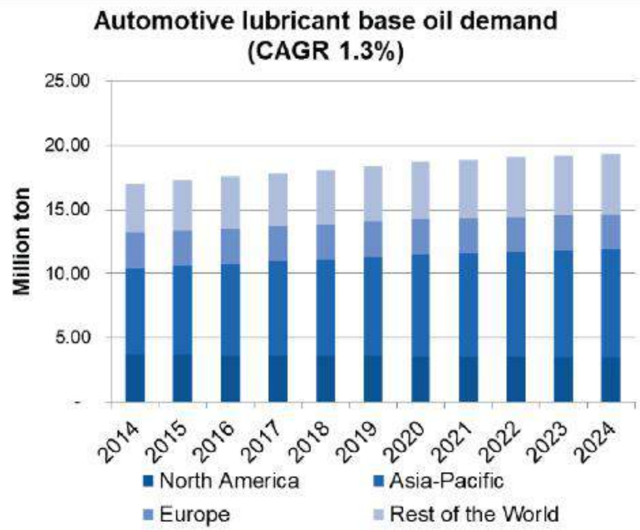
Within a rapidly growing battery market, Malaysia can drive graphene development by incentivising the local market

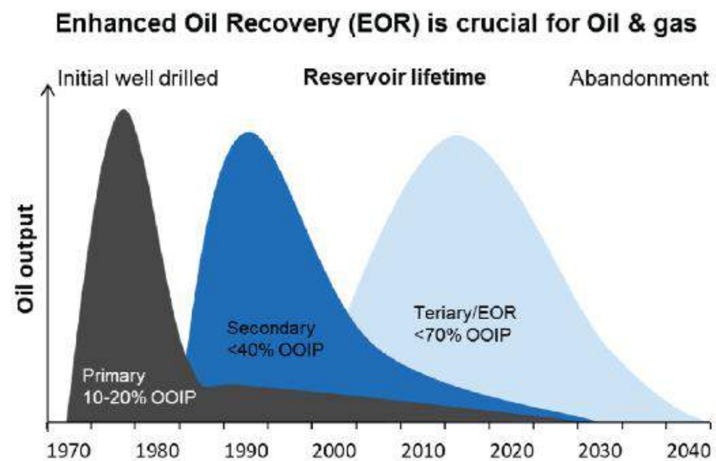
	GNI impact	Job creation	Malaysia's government role
Energy storage	**RM 150 million**	**100 jobs**	Drive adoption by incentivising **local energy storage market**



Graphene-enhanced lubricants can offer Malaysia's O&G sector a differentiated advantage in a competitive market

	GNI impact	Job creation	Malaysia's government role
Lubricants	**RM 350 million**	**150 jobs**	Gaining **buy-in from local oil and gas majors** to invest in graphene

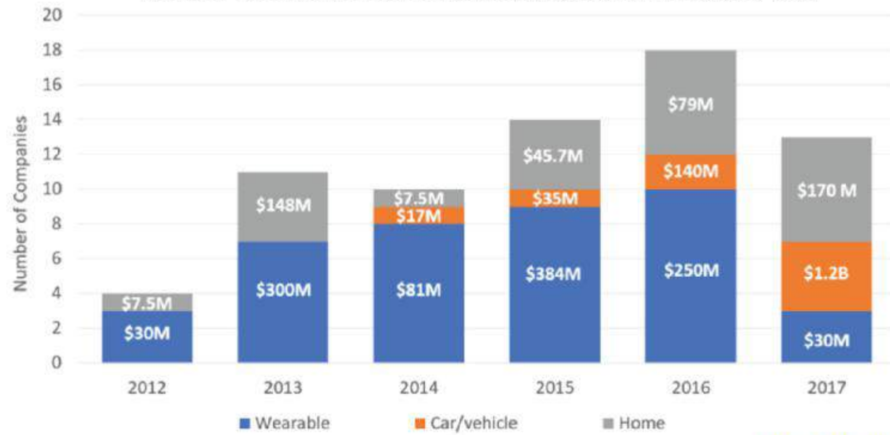




Higher-value conductive ink applications opens the door for Malaysia's to capitalise on IoT market growth

	GNI impact	Job creation	Malaysia's government role
Conductive Inks	**RM 600 million**	**400 jobs**	**Target high-value applications** for flexible electronics, sensors, and IoT

Number of consumer IoT companies that over 5 million, by year



Source: Lux Research Analyst Insight

Looking at Printed Electronics And its Present Day Applications

April 27, 2017 | Analyst Insight | by Tracy Woo

Predictive maintenance carries Strong momentum through 2017

November 30, 2017 | Analyst Insight | bt Alex Herceg

By 2020, Malaysia can add RM 5,450 million to GNI and create 3,300 Malaysian jobs, with potential to grow onwards to 2025

	GNI Impact	Job creation	Malaysia's government role
 Lithium-Ion Battery & Ultracapacitors	RM 1,450 million	650 jobs	Attract graphene developers targeting aerospace composites
 Rubber Additives	RM 2,900 million	2000 jobs	Connect industry to high-quality graphene master-batch supply
 NanoFluids	RM 150 million	100 jobs	Drive adoption by incentivizing local energy storage market
 Conductive Inks	RM 600 million	400 jobs	Target high-value applications for flexible electronics, sensors, and IoT
 Plastics Additives	RM 350 million	150 jobs	Gaining buy-in from local oil and gas majors to invest in graphene

iNanovation™

iNANOVATION

iNanovation is E v}D o Ç flagship SME programme which provides enterprises and start-up companies in the nanotechnology space with the support they require to grow their business These include mechanisms to ensure SMEs are able to establish market share through the introduction of new processes or materials, and to successfully effect a shift from current conventional processes, to cutting edge nanotechnology enabled operations

The iNanovation platform comprises of three key verticals, namely, iNanovation Push, iNanovation Pull and iNanovation Switch Each of these verticals provide facilitation schemes to assist SMEs and start-ups expand their business presence in the nanotechnology industry. These include the provision of venture funds and soft loans, business partnership, and technology expertise and support

Our focused support of businesses within the nanotechnology space is conducted via our investments and equity stake holding Deliverables obtained from the projects we spearhead, along with the profits earned from our joint ventures are fed back into iNanovation This ensures that we have a virtuous cycle of funds and expertise which we can avail of to further invest in new nanotechnology ventures Our approach ensures that we are able to stay ahead of the curve in the Malaysian nanotechnology scene

Product development and commercialisation programme utilising 3 approaches.

iPUSH

- "Pushes" nanotechnology products into the marketplace
- Assists local SMEs and start-ups establish a foothold in the nanotechnology industry
- Available for local SMEs and start-ups, as well as foreign companies

iSWITCH

- Product development and prototyping joint ventures for collaborations with industry, research institutes and academic institutions
- Monetisation obtained through licensing or product sales
- Initiatives to improve products, increase market share and aid companies to expand their reach into new markets
- Available for locals SMEs and start-ups, as well as foreign companies with local collaborators

iPULL

- Helps companies enhance current production processes, to drive the shift from conventional manufacturing to nanotechnology enabled manufacturing, which provides greater productivity and efficiency
- Initiatives to improve products, increase market share and assist businesses venture into new markets
- Available for large companies, SMEs and start-ups

Food and Agricultural

9 Projects

Electronic Devices and Systems

11 Projects

Energy and Environment

11 Projects

Wellness, Medical and Healthcare

5 Projects

iNANOVATION ACHIEVEMENTS AS AT END 2018 IN THE E&E SECTOR

Company	Nanotechnology Products	Application	Advantages
Hans LedSdnBhd	Thermal substrate for LEDs	‡ Production of CuCNT Substrates for LED Applications	‡ Improved thermal conductivity further enhances the lifespan of > • v Œ µ • o š Œ] v] ‡ Improved heat management translates into increased energy efficiency
TropBioSdnBhd	Aquaponics solution	‡ Development of Internet of Nano Things (oNT) applications in aquaponics	‡ Optimization of power usage for self sustaining aquaponics setup. ‡ Nanotechnology enhanced agriculture produces
DNA LaboratoriesSdnBhd	Mycobacterium Tuberculosis nanotubes (MWCNT)	‡ Development ofnanofibre based biosensor system for detection of tuberculosis (TB)	‡ Provides ultrasensitive, noninvasive, affordable and portable detection of d 2

iNANOVATION ACHIEVEMENTS AS AT END 2018 IN THE FOOD AND AGRICULTURE SECTOR

Company	Nanotechnology Products	Application	Advantages
Malawira Sdn Bhd	Nanocellulose	‡ Nanofibre and nanocellulose from oil palm empty fruit bunches	‡ Sustainable waste-to-wealth concept which produces nanofibre and nanocellulose for various applications such as wound u v P u v š 2 U š š Æ š] o • 2 v }] o Œ } À Œ Ç ‡ Diverse product applications as a result of the utilisation of nanocellulose and nanofiber
NanoSiltech Sdn Bhd	Nanosilica	‡ Production of nanosilica from rice husk	‡ Sustainable waste-to-wealth concept of producing nanosilica ‡ No harmful greenhouse gases (GHG) emissions
Pulsar UAV Sdn Bhd	Unmanned Aerial Vehicle (UAV) Fertiliser	‡ IoNT Project for the development of an integrated UAV application map and fertiliser with organic plant nano-enhancer dispenser solution to provide precision farming service	‡ Utilises GPS-guided farming technology drones by combining nanofertiliser to disperse fertiliser to large scale plantations more efficiently
GreenEklan Sdn Bhd	Smart urban farming kit	‡ Provides sustainable services in lighting technologies and automation systems via an urban farming kit which uses nano-based solar panels (NLEP) and zeolites	‡ Reduces dependence on electrical energy by using solar power, thus reduce GHG effects ‡ Creattion of Smart Urban Aquaponics kits which can be deployed to homes, offices, communities, non-governmental organisations (NGO) and schools

iNANOVATION ACHIEVEMENTS AS AT END 2018 IN THE ENERGY AND ENVIRONMENT SECTOR

Company	Nanotechnology Products	Application	Advantages
Swiflet Eco Park Holdings SdnBhd	‡ Oxygennanosensorand nanolight energy panel	‡ IoNTswiflet monitoring system to develop and improveSwiflet Eco W Œl[•]Œ • v •š ‰Œ} µ š]}v capacities ‡ Maintenance of optimal bird house ecosystem through continuous monitoring of the ambient temperature, humidity levels and oxygen levels ‡ Using a video analytic (VA) to coun birds	‡ IoNTapplication allows for precision agriculture by optimising conditions within the bird house ‡ Ability to track the bird population effectively

iNANOVATION ACHIEVEMENTS AS AT END 2018 IN THE WELLNESS, MEDICAL AND HEALTHCARE SECTOR

Company	Nanotechnology Products	Application	Advantages
Infusions Material Lab Sdn Bhd	Claralite negative ion lamps	‡ Technology licensing and commercialisation of Claralite Illuminator with nano-infused yarn	‡ Generates healthy negative ions and inhibits growth of microbes in infused objects and materials
PONEY Garments Sdn Bhd	Z]o Œ v[• o}šZ]vP	‡ Nanotechnology functionalised ‰‰ Œ o (}Œ šZ Z]o Œ v[• o}šZ]vP segment	‡ Utilises nanohybrid technology to provide antibacterial, odour resistant, and other hygienic properties ‡ Eliminates unpleasant odour and kills bacteria ‡ Prevents skin rashes, allergies and dermatitis ‡ Antifungal and antimicrobial properties ‡ Prevents and treats dermal infections, mycoses and eczemas
Biopro Cosmeceutical Sdn Bhd	Cosmeceutical product: cosmetic products with bioactive ingredients with medical benefits	‡ The distinctive characteristic of the ‰Œ} µš]•]š• µv]‹µ Dermags_ delivery system, which incorporates noisome technology alpha mags as nanocarriers to address skin pigmentation issues	‡ Enhances the penetration and distribution of the active compound to the stratum vorneum and skin epidermis ‡ Intensive brightening serum

ADVANCED MATERIALS INDUSTRIALISATION

ADVANCED MATERIALS INDUSTRIALISATION

ADVANCED MATERIALS INDUSTRIALISATION

The programme creates technology platforms and industrial laboratories for Small, Medium and Large Enterprises to improve their products by adopting advanced materials.

Advanced Materials platform development.

Adoption of Advanced Materials in processes, intermediates, and finished products.

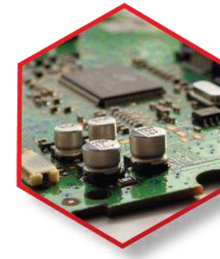
NanoVerify certification to provide governance and avoid consumer confusion and market advantage to local manufactures

Advanced Materials Industrial Laboratories & Shared Facilities

Scale- up, Productivity Improvement & Capacity Building

Food and Agricultural

2 Projects



Electronic Devices and Systems

8 Projects

Energy and Environment

4 Projects

Wellness, Medical and Healthcare

5 Projects

WHAT WE HAVE ACHIEVED

Through the Advanced Materials Industrialisation Programme, we provide services which encourage the adoption of advanced materials for the purposes of product industrialisation. In addition, the programme provides governance oversight in terms of verification and certification relating to the proper utilisation of advanced materials in line with recognised global best practices. This enables local manufacturers to obtain a market advantage adopting advanced materials in nanotechnology products and applications. Our structured approach ensures the seamless migration of technology for processes, intermediaries and final products.

COMPANIES WE HAVE ASSISTED

Company	Nanotechnology Products	Application	Advantages
EclimoSdnBhd E&E Sector	Battery management system for electric motorcycles	‡ Integration of graphenebased ultracapacitor tLi-ion (lithium ion) Battery Module t into electric vehicles (EV)	‡ Absorbs power surges, enabling EV t function at almost 100% of its capacity
Pulsar UAVSdnBhd E&E Sector	Fuel Cell	‡ Development of High Efficiency Fuel Cell Pack for unmanned aerial vehicle (UAV) Applications	‡ Fuel cell technology enables mid flight energy generation ‡ Prolonged geomapping to detect hot spot areas
NanoTextileSdnBhd Wellness, Medical & Healthcare Sector	Antimicrobial textile	‡ Eliminates unpleasant odour and kills bacteria	‡ Prevents skin rashes, allergies and dermatitis ‡ Antifungal and antimicrobial properties ‡ Prevents and treats dermal infections, mycoses and eczemas
MDT InnovationsSdnBhd Wellness, Medical & Healthcare Sector	Linen management	‡ Development and Proof of Value (PoV) IoNTsolution for linen management	‡ Reduces water wastage through identification (ID) of linen and ensures accurate laundry record I ‰] v P 2 ‡ Maintains high quality of linen by tracking linen lifecycle

INTELLECTUAL PROPERTY

INTELLECTUAL PROPERTY

Nanotechnology advancements and trends are impacting the way Intellectual Property (IP) is defined and administered Questions relating to how to classify these new technologies, and how to protect a } u ‰ v Ç [• interest in nanotechnology inventions are among the issues which weigh the most heavily on the minds of industry players Within a relatively new nanotechnology industry, the commercialisation of nanotechnology products have remained relatively modest However, future potential in terms of applications and business growth, have resulted in increasing number of patent protection applications for nanotechnology enabled products

Distinguishing Between Different Intellectual Property

In general, IP refers to any tangible asset that is created from an original thought t be it an idea, name, content, design, invention or digital media IPs which are protected by law broadly covers patents or utility innovations, copyright, trademarks and trade secrets Obtaining intellectual property protection enables individuals and businesses to earn recognition or financial rewards from the fruits of their labour, thus balancing the interest of innovators, against the greater public good that new inventions can bring.

PATENTS

Patents are applicable to new inventions that solve a specific problem in any field of technology or industry. To protect against competitors exploiting an individual or business' work product, it is prudent to have the invention patented. In order to qualify for a patent, Section 11 of the Patents Act 1983 provides that an invention is patentable if it is new, involves an inventive step and is industrially applicable.

UTILITY INNOVATIONS

Utility Innovations protect new technical inventions by granting an exclusive right to prevent others from commercially exploiting the protected inventions without consents. In particular, Utility Innovations protect inventions that make small improvements to, and adaptations of, existing products or that have a short commercial life. The requirement to obtain protection is less stringent than patent protection, as the need of inventive step is omitted.

COPYRIGHT

Copyright is something we see in our lives each day, such as books and works of art. Authors of works covered by copyright have rights over their literary and artistic works. This extends only to expressions, and not to ideas, procedures, methods of operation or mathematical concepts.

TRADEMARKS

A trademark is registered to protect a brand, a name of a product or a service. Registration of a trademark gives an exclusive right to the use of the registered trademark by its owner or licensed to another party.

TRADE SECRETS

A trade secret is information that includes a formula, pattern, compilation, program, device, method, technique or process. It must be used in business, and gives an opportunity to obtain an economic advantage over competitors who do not know or use it. As it is information that is not known to the public, the owner of a trade secret can undertake reasonable efforts to maintain secrecy.

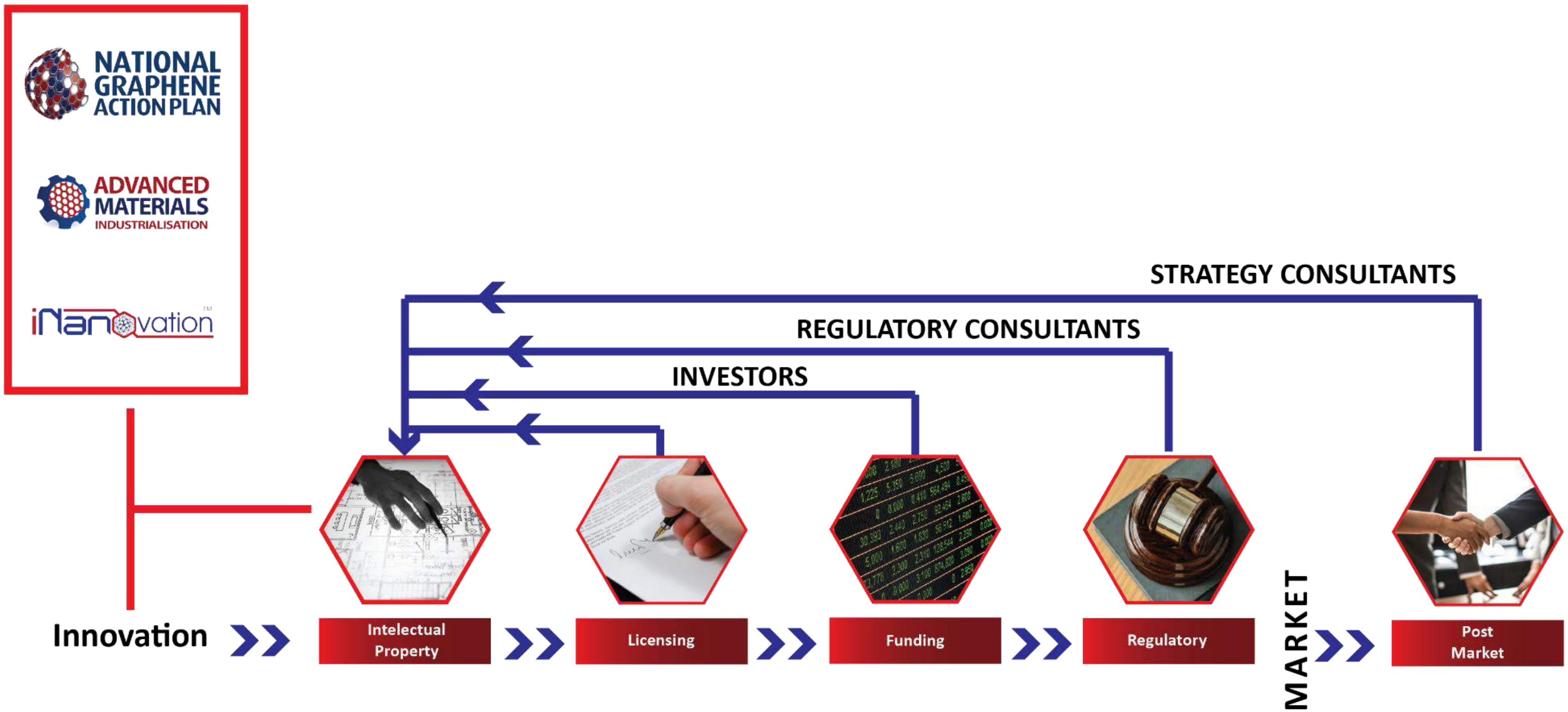
INTELLECTUAL PROPERTY

Capitalising Intellectual Property

Essentially, nanotechnology centres on the capitalisation of IP. Nanotechnology products or processes which have IP can be developed or further commercialised for future projects, enabling continuous cycles of licensing, funding, market penetration and market expansion.

IP Achievements As At End 2018

‡ 7 Patents
‡ 1 Utility Innovation
‡ 4 Copyrights



CASE STUDIES

TYPE OF IP : SWIFTLET FARMING SELF-POWERED INDOOR MONITORING SOLUTION

NanoMalaysia initiated a scaleup project at a licensed swiftlet ranching farm located in Belara and Setiu, Terengganu. The system maintains the bird house ecosystem by monitoring the temperature, humidity and oxygen levels through the use of nanosensors, as well as using video analytic to track the population of the birds. The Internet of NanoThings (IoNT) swiftlet monitoring system will improve bird nest productivity levels efficiently and increase profitability.

TYPE OF IP : ENERGY STORAGE DEVICE WITH MNA RESEARCH SDN BHD

This project was activated by MNA Research Sdn Bhd with E v}D o Ç[• assistance. The project focuses on a hybrid battery based on a graphene super capacitor and lithium ion called the Graphene Electrical Generator (GeG). The GeG produces electric without using any form of fuel, nuclear fission or fusion nor radiation. It is a pseudo perpetual machine that generates electricity within its own energy storage. A total of 100 units of IPS GeG can deliver constant 3MW of electricity 24 hrs per day, unlike solar farm or wind turbine generator. There is enormous potential for this technology in future and]š[• application ranges from as primary electrical generator, to power train for buses, trucks and light transit rails to electrification of rural communities, schools and village

INDUSTRY PARTNERS

BUSINESS PARTNERS

TECHNOLOGY COLLABORATORS (RESEARCH INSTITUTES & RESEARCH UNIVERSITIES)

MONETISING NANOTECHNOLOGY

5

OUR BUSINESS OBJECTIVES

Our six core business areas are focused on generating long-term sustainable growth within the four key strategic Jumpstart sectors identified as providing the greatest potential for value creation and profitability.

We actualise our strategic intent through the business activities we conduct throughout the year. In order to ensure that we are able to maximise value creation and generate outcomes which are aligned with our objectives, we have in place a comprehensive and structured project management workflow process. Our disciplined commitment to remain on course with executing our strategy through our comprehensive business model has contributed towards our robust business fundamentals and the long-term resilience of our business

Our Business Objectives

Driving Economic Growth and Commercialisation

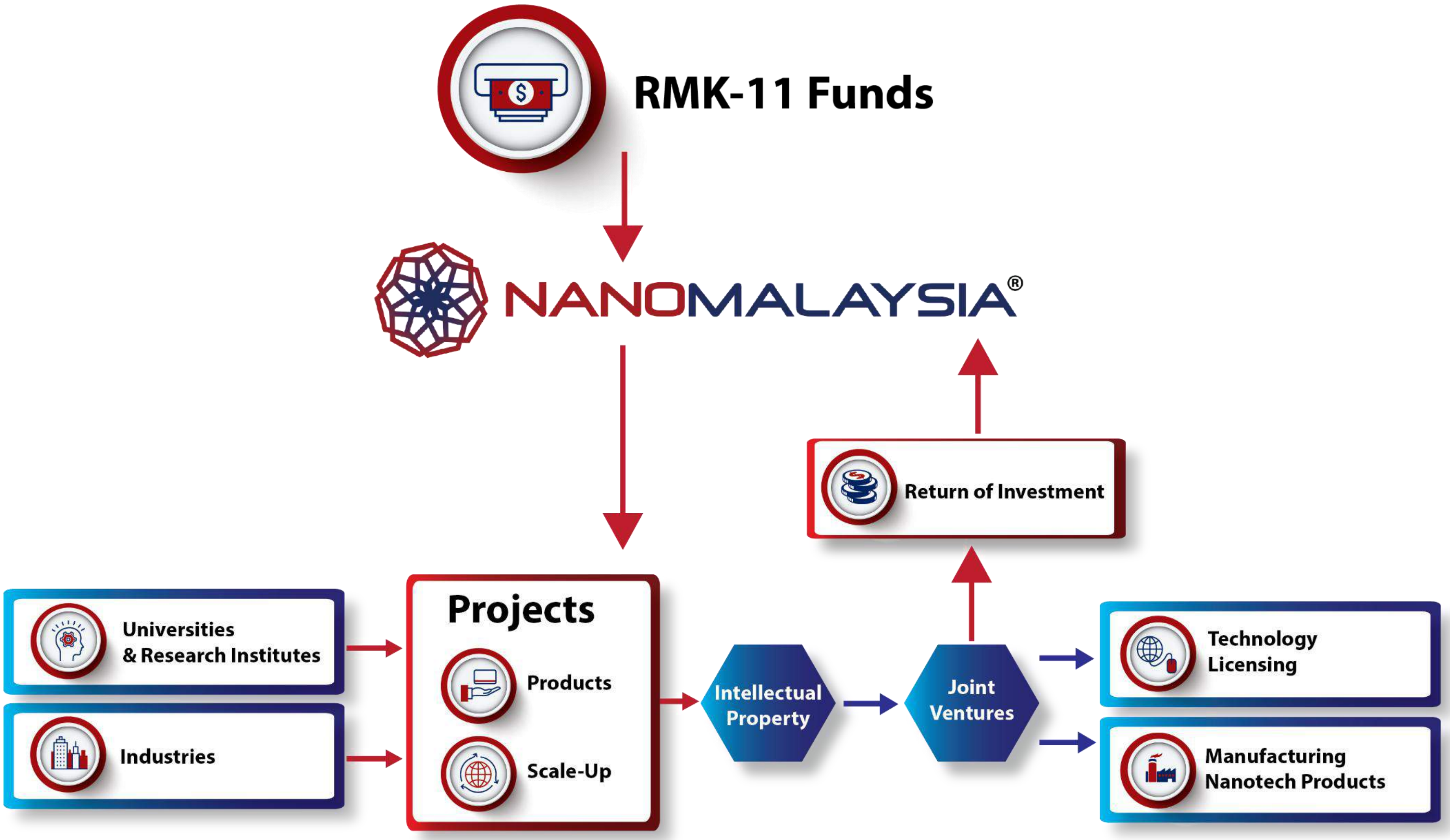
Strengthening The Ecosystem and Enchancing Competitiveness

Increasing Public Awareness and Joint Development Efforts

Spearheading the Nanotechnology Revolution by Re-energising Industries

*Note : Based on NanoMalaysia Berhad's Memorandum of Association

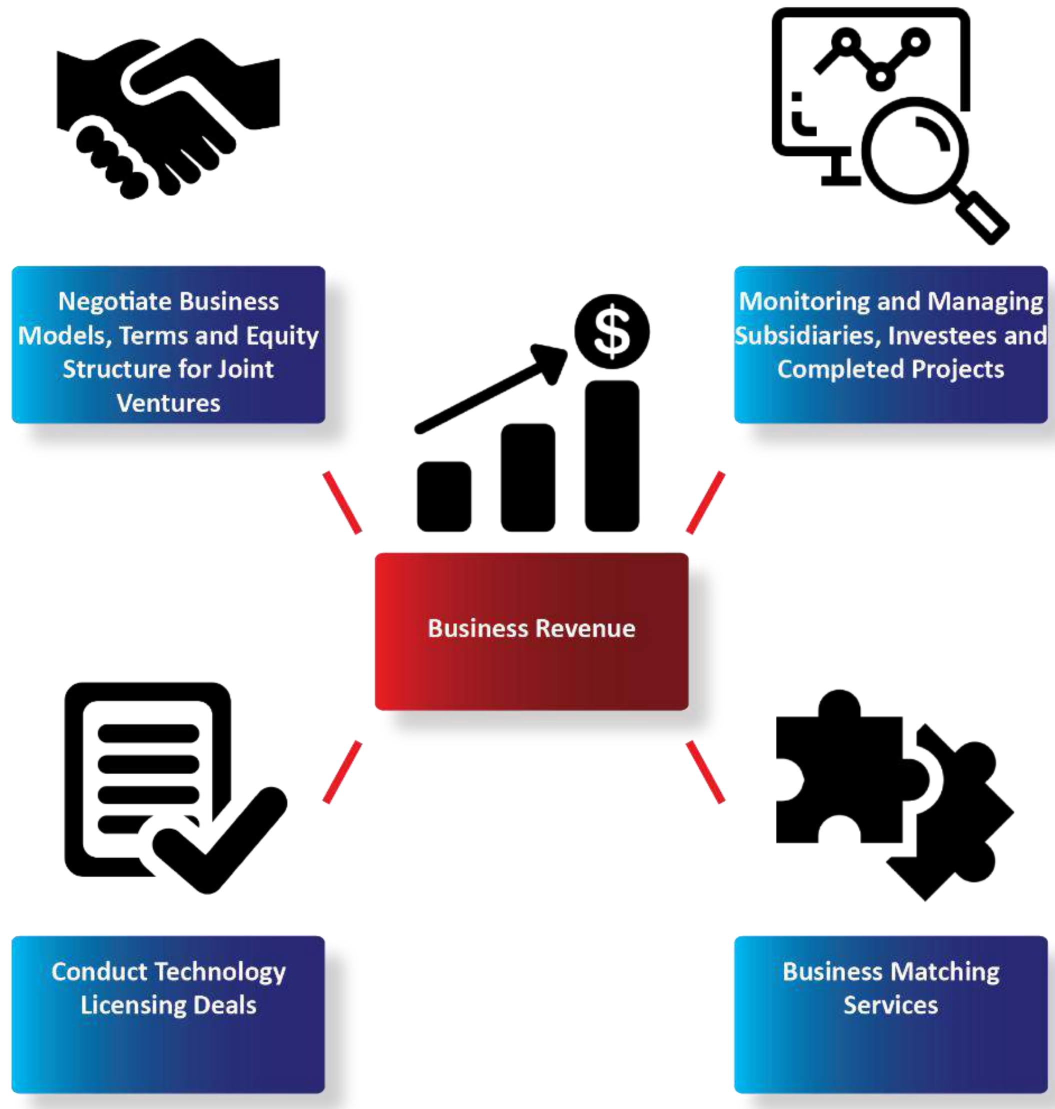
OUR BUSINESS MODEL



ENABLING GROWTH THROUGH STRATEGIC PARTNERSHIP

Through various collaborations and joint ventures, NanoMalaysia has successfully delivered on commercialisation activities which are contributing to our business revenue and the ongoing sustainable development of the local nanotechnology sector.

For more information on our various programmes and commercialisation activities, as well as their outcomes, please refer to the section titled ‘NanoMalaysia Programmes’ in this Strategic Report.



BUSINESS SERVICES

Key Activities

NANOMALAYSIA'S PHASES OF GROWTH

6

1$120$/$<6,$¶6 3+$6(6 2) *52:7+

PHASE 1

Positioning and Branding

PHASE 2

Creating Economic Value

PHASE 3

2019 and Beyond 4th Industrial Revolution

REVOLUTIoNT

A Revolution 4.0 the Internet of Nano-Things

Since inception, NanoMalaysia has been through two distinct phases of growth. Our first phase spanned the period between 2011 and 2014. In this phase, we focused on building our brand and refining our market positioning to build strong foundations for our business and ensure the long-term resilience of our business

Our second phase of growth encompassed the period between 2015 and 2018. During these years, our focus was on creating economic value to ensure long-term growth and profitability through our various strategic programmes and collaborative partnerships with leading international nanotechnology agencies and companies

Moving into our next phase of growth, our focus is on Spearheading the Nanotechnology Revolution in Malaysia through our Fourth Industrial Revolution (4 IR) Internet of Nano Things (IoNT) driven RevolutIoNT strategy. Our goal in our third phase of growth is to achieve financial independence, and ensure the long-term sustainability of our business

PHASE 1: POSITIONING & BRANDING

2011

- Incorporated on 1 August 2011

2012

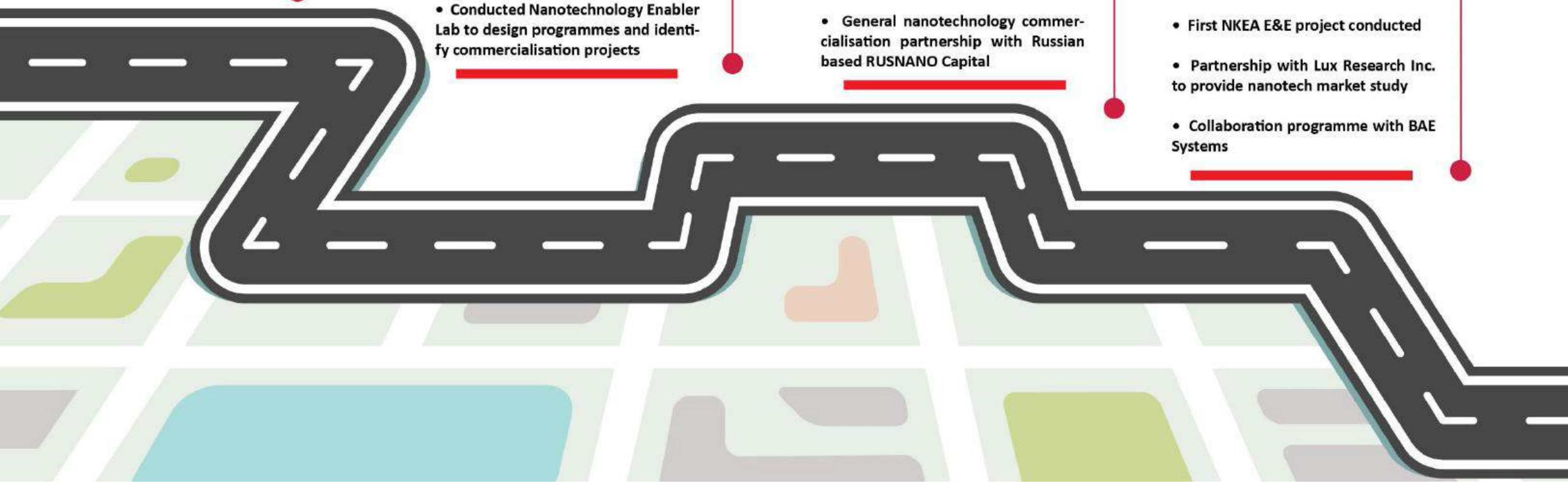
- Signed MOUs with Advanced Energy Research and Technology Center (AERTC) New York and Malaysian Industry - Government Group for High Technology (MIGHT)
- Conducted Nanotechnology Enabler Lab to design programmes and identify commercialisation projects

2013

- MOU with IBM and start of IBM Star Polymer Joint-Research Programme
- MOU with Human Life Advancement Foundation formed the iNanovation platform
- Conducted Nanotechnology Enabler Lab 2.0
- Creation of National Key Economic Area (NKEA) Electrical and Electronics (E&E) Entry Point Project (EPP20) for nanotech applications
- General nanotechnology commercialisation partnership with Russian based RUSNANO Capital

2014

- Led National Graphene Strategy Study conducted by McKinsey & Co./Agensi Inovasi Malaysia (AIM)
- Launched the National Graphene Action Plan 2020 (NGAP2020) programme
- Incorporated Nano Commerce Sdn Bhd and Nanovation Ventures Sdn Bhd
- First NKEA E&E project conducted
- Partnership with Lux Research Inc. to provide nanotech market study
- Collaboration programme with BAE Systems



PHASE 2: CREATING ECONOMIC VALUE

2015

- Incorporated NANOVerify Sdn Bhd
- Launched the NANOVerify certification programme
- MOSTI TechnoFund project – Cu-CNT LED Mounting Substrates with UTP, SIRIM and HANS LED
- NanoMalaysia CEO appointed as Treasurer of Asia Nano Forum

2016

- 21 product development and 7 scale-up projects executed
- 27 products developed and 6 products commercialised
- 28 IPs developed
- Launched annual Graphene Malaysia international event
- MOU with Taiwan based TANIDA on cross-country nanotech product certification

2017

- 16 product development and 4 scale-up projects executed
- 16 products developed and 6 products commercialised
- 23 IPs developed MOU with Nanopolis Suzhou
- NanoMalaysia CEO appointed International Advisor to the China Innovation Alliance of the Graphene Industry

2018

- 14 product development and 8 scale-up projects executed
- 7 products in development
- 2 IPs developed
- 5 patents and 3 copyrights filed with MyIPO


PHASE 3
2019 AND BEYOND
REVOLUTIoNT
A Revolution 4.0 the Internet of Nano-Things

OUR 4TH INDUSTRIAL REVOLUTION STRATEGY

7

OUR STRATEGY BEYOND RMK -11

NanoMalaysia was founded as Malaysia's lead agency for the commercialisation of nanotechnology. In ensuring that we achieve our business objectives, we are providing the industry with technology and business leadership crucial for the sustainable long-term development of the nanotechnology industry.

NanoMalaysia's strategic growth ambitions are guided by our strategy which leverages on the opportunities available as a result of the Fourth Industry Revolution's (4 IR) Internet of NanoThings (IoNT). IoNT refers to the interconnection of nanosensors and nanodevices with the Internet which has led to the development of next-generation standards based on the Internet of Things (IoT). NanoMalaysia's strategy is premised on our strong belief that IoNT will be the core driver of 4 IR, and catalyse transformational and revolutionary changes in industry, business and society.

Our primary goal is to capture revenue streams associated with nanotechnology and IoNT I enabled products and applications. We do this by focusing our financial and human resource investments into business ventures and projects that are feasible and offer realistic and high value returns in the medium to long-term. We also stress the importance of national agendas relating to job creation, as well as an environmentally greener future.

In the short to medium-term future, our focus is on our RevolutIoNT strategic campaign as the key driving force to mobilise the local industry, in line with our ambition to Spearhead the Nanotechnology Revolution in Malaysia. Our RevolutIoNT strategic blueprint takes into account the myriad benefits nanotechnology has provided through enhanced and efficient solutions within various applications in food and agriculture, wellness, medical and healthcare, electronic devices and systems, and energy and the environment.

In order to generate returns for our stakeholders which are aligned with our identified goals and targets, we have in place programmes to catalyse the growth and development of the fledging nanotechnology sector in Malaysia. Through our core programmes of the National Graphene Action Plan 2020 (NGAP2020), iNanovation and Advanced Materials Industrialisation, we are providing support for large local and multinational companies based in Malaysia, as well as local Small and Medium Enterprises (SMEs).

These programmes were developed under the 11th Malaysian Plan (11MP) which had identified the commercialisation of nanotechnology has a potential high growth sector to drive national economic growth. We are driving nanotechnology commercialisation through product development and scale up projects.

OUR STRATEGY

NanoMalaysia Programmes

NATIONAL GRAPHENE ACTION PLAN

National Graphene Action Plan
- Product development and commercialisation programme
- Produces Intellectual Property and products
- Focuses on 5 Key Applications:
  - Lithium-ion battery
  - Conductive inks
  - Rubber additives
  - Plastic additives
  - Nanofluids

iNanovation™

iNanovation
- Product development and commercialisation programme based on broader nanotech innovation
- Produces Intellectual Property and products
- Focuses on 4 Jumpstart Sectors:
  - Electronic Devices and Systems
  - Food and Agriculture
  - Energy and Environment
  - Wellness, Medical and Healthcare

ADVANCED MATERIALS INDUSTRIALIZATION

Advanced Materials Industrialisation
- Industrialisation programme for advance materials products and services
- Enables technology migration in processes, intermediaries and finished products, and manufacturing upscaling via:
  - Scale-up, productivity improvement, and capacity building
  - Technology platform and product development with industry
  - Upscaling existing shared industrial laboratories

NANO Verify

NANOVerify Certification Programme
- Strengthen product reputation and credibility in local and international markets by creating positive brand association
- Increase consumer awareness

4th Industrial Revolution [Internet of Nano Things (IoNT)]

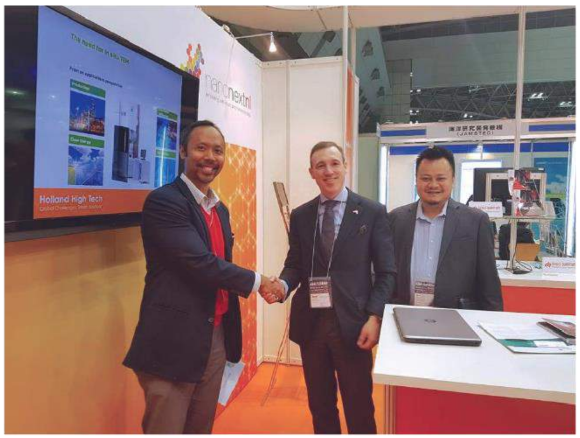
REVOLUTIoNT
A Revolution 4.0 the Internet of Nano-Things
RevolutIoNT Strategic Blueprint

Capturing opportunities with NanoMalaysia programmes via product development /scale up projects and commercialisation activities

2018
HIGHLIGHTS

FEBRUARY 2018 Asia Nano Forum Executive Committee Meeting, Japan.

Dr Rezal as the Treasurer of ANF, presenting the Financial Statement and Budget to the Asia Nano Forum Executive Committee Meeting, in Tokyo, Japan.



NanoMalaysia initiated first discussions for smart cross-country partnership with Canada & Holland, during Nano Tech Japan 2018, in Tokyo.

FEBRUARY 2018 Nano Tech Japan 2018, in Tokyo.

NanoMalaysia Berhad brings MOSTI officials to visit two of NanoMalaysia's strategic partners; Scomi Global Research & Technology Center and Nanopac Sdn Bhd on their last day of the internship program.

FEBRUARY 2018 MOSTI Internship Program.