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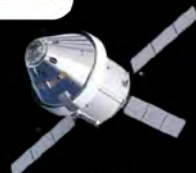
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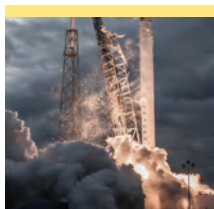
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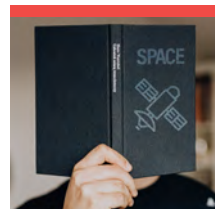
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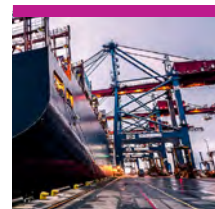
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myForesight® is a pioneering national level initiative dedicated to the prospecting of technology for business through the field of Foresight. It provides a common Malaysian based platform for the Government, Industry and Academia to share experiences, insights and expertise on the strategic futures issues, both at the local and global levels.

Its key components are intelligence, research, competency and community. myForesight® raison d'être is to accomplish the following:

1. Shaping Malaysia's future possibilities;
2. Promoting and mainstreaming of foresighting in national, sectoral and corporate planning;
3. Identification of key technologies to support sectoral development;
4. Identification of key and potential industries from a technology perspective.



**RUSHDI ABDUL RAHIM**

*rushdi@might.org.my*

# Initial Thoughts

## "Space. The final frontier..."

begins the famed opening monologue of the popular television series Star Trek: The Next Generation.

Space technology is crucial in advancing social well-being and sustainable growth as part of the world's expanding digitalisation transition. Space technologies have the potential to bridge the digital divide, monitor climate change, weather patterns, and the use of natural resources, as well as create new economic opportunities.

In recent years, the space industry has been gaining momentum and expanding beyond the traditional spacefaring nations as more people are seeing the potential benefits of investing in space exploration and technology. Private and public entities from emerging spacefaring nations have recently increased in number as actors engaged in space activities.

In this respect, The Organisation for Economic Co-operation and Development (OECD) released a report titled "Space Economy – For People, Planet & Prosperity". The report served as discussion material at the Space Economy Leaders Meeting, where the aim is to improve the measurement of the space economy and its broader impacts.

India launched its National Space Policy in April this year. The space policy further enhances the growth of the Indian space sector by providing the private sector with a platform to actively contribute to augmenting the development and competitiveness of the Indian space industry. The World Economic Forum reported that in 2022 alone, 47 startups were incorporated in India's space sector. The expansion of India's space sector led to the establishment of a successful launch programme. India has accomplished this by combining government investment, partnerships with established space agencies, and a supportive environment for entrepreneurship and innovation.

Another example is the United Arab Emirates (UAE), which has made significant investments in its space programme and has formed alliances with several countries and companies to support its development. In order to encourage the development of its space industry, the country has also formed a national space agency and a number of initiatives in the field. The UAE has ambitious plans for space exploration, including building the first settlement on Mars by 2117.

Is Malaysia motivated to grow its space industry?

Stakeholder conversations revealed this to be true. While it may seem like a daunting challenge for countries with limited resources like Malaysia to embark on the space sector, our conversations with various parties highlighted several strategies that can be employed to help build a robust space industry.

The need to **establish a solid scientific and technical knowledge foundation** is commonly highlighted. Investment in education and training programmes is crucial to ensure the availability of the skilled workforce required to support the space industry. This can be achieved by establishing partnerships with other countries or by creating our own specialised universities and research centres.

Next is **investment in the necessary infrastructure and resources**. This includes the construction of launch sites, the development of satellites, and the establishment of ground control stations. This could be accomplished by forming partnerships with reputable space agencies or companies to facilitate infrastructure construction and leveraging existing technologies and resources to reduce costs and maximise efficiency.

“

*The greatest danger for most of us is not that our aim is too high, and we miss it, but that it is too low, and we reach it.*

”

- Michelangelo

Another crucial factor in establishing a space business, emphasised by the people we spoke with, is fostering **innovation and entrepreneurship in the space sector**. The government could provide incentives for private companies to invest in space technology and exploration. This includes tax breaks, funding opportunities, and other incentives that encourage private investment. Creating a supportive environment for innovation and entrepreneurship can attract new businesses and encourage growth in the space industry.

**Collaboration and partnership** are also seen as critical for the development of the space industry. Sharing resources, knowledge, and expertise would be made possible by collaborating with other emerging countries and existing space agencies. Additionally, collaboration can increase efficiency and cut costs. Finally, stakeholders agree that there is **a need for a long-term vision for Malaysia's space industry**. This entails establishing clear goals and objectives for our space programme as well as developing a roadmap for achieving those goals. In order to ensure the long-term sustainability of our space industry, we must devise plans for preserving and improving its resources and infrastructure over time.

With the right strategies and investments, we can build a robust space industry that will provide economic, scientific, and technological benefits for generations to come.

On another note, a national space industry offers inspirational and cultural significance. The space industry's growth can also improve a country's international reputation and strengthen its national pride and identity. We have observed how space exploration has captured the imagination of people worldwide and inspired generations to seek careers in science and technology.

In this current edition, we have prepared a number of insights and viewpoints on the Malaysian space industry and advanced air mobility. I hope that the information presented in this magazine remains interesting to you and adds value to the work you undertake. We welcome any content contributions in the form of viewpoints or insights you would like to share. Of course, comments are also encouraged. Do reach out to us.

I look forward to hearing your thoughts on these matters.

As we aspire to develop the space industry in Malaysia, I'll leave you with this quote.

*"The greatest danger for most of us is not that our aim is too high and we miss it, but that it is too low and we reach it."*

- Michelangelo

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RUSHDI ABDUL RAHIM



# from the desk of...

**DATUK DR. MOHD YUSOFF SULAIMAN**

President & Chief Executive Officer  
Malaysian Industry-Government Group  
for High Technology

## Spurring the Space Industry Ecosystem: THE MALAYSIAN SPACE INDUSTRY CONSORTIUM

### Space Economy: why is it significant?

The space economy has been pursued for decades by developed nations in order to exhibit their technological prowess and, at the same time, benefit from the business and research development involved. Space has always been seen as the next frontier for human exploration and survival. There are many examples where the technology and outcomes from the space industry were cascaded to other sectors and applications.

The significance of the space industry for developing countries like Malaysia is undeniable since it offers great potential for the modernisation of traditional sectors like agriculture, fisheries, mobility, gamification and construction. With the potential of far-reaching satellite applications and bigger international space stations, the next 10 to 15 years could bring about significant progress in these areas.

Therefore, it is crucial for Malaysia to focus on the space industry's potential in transforming new and emerging sectors and harnessing its potential for the betterment of humanity.

### Developing indigenous technology

Malaysia aspires to become a significant space player by setting high aspirations and goals that will inspire and motivate the younger generation. Therefore, we need to cultivate innovative and knowledge-sharing mindsets. For instance, JFK's goal of sending a man to the moon captured the imagination of the American people and motivated them to work hard to become the leading player in space. Similarly, Malaysia can set ambitious goals that will excite and motivate our people to be competitive and achieve greatness together.

Another factor to take into consideration is that sufficient resources, including a significant budget, is essential in the space industry. Countries like China and the United States are continuously investing billions of dollars into the industry every year. Therefore, Malaysia needs an adequate budget and a clear framework that will align industry stakeholders, including government, industry, academia, NGOs and partners, to work together and leverage their collective strength. Through collaboration and co-creation, Malaysia can expedite its space industry development "without re-inventing the wheel" by working closely with like-minded nations and organisations.

Developed countries have been collaborating for years, as seen in the International Space Station programme involving the United States, Europe, Russia, and China. The next decade will see developing nations initiating and developing their own competencies by working together. For example, Malaysia and Türkiye have started developing initial plans to collaborate in the sector. Furthermore, within the ASEAN region, there is a huge potential for countries to join forces and benefit from applying the technologies in the space sector to other sectors.

One lesson we can learn from the space industry is that the country's aspirations and high hopes will capture the imagination of the people and propel progress. Young people will be motivated to be innovative and knowledgeable and further inspired to pursue high-value jobs such as astronauts, engineers, data scientists and technologists that will further contribute to transforming Malaysia into a developed nation.

The space industry offers huge economic, institutional, regulatory, talent and technology development opportunities. Collaboration and co-creation will optimise our resources, while aspiration will drive our effort and motivation toward successful development of the space industry.

“

*I am excited about the space industry's next ten years and hope our space aspirations will become a reality.*



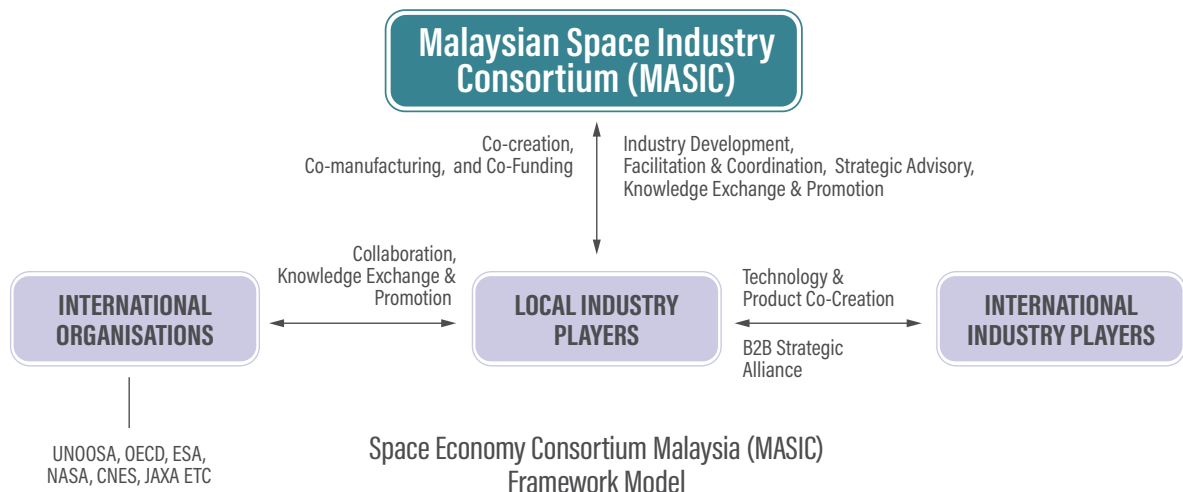
## Space Consortium: A way forward

The recent establishment of the Malaysian Space Industry Consortium (MASIC) will serve as the focal point in linking industry players, Government and academia to work together, improving the capability, capacity and ultimately the competitiveness of the Malaysian space industry. MASIC will also act as the coordinator to oversee the implementation of the strategies in the Space Industry Strategic Plan 2030.

Co-funding between the public and private sectors should be the new business model for Malaysia. This model will provide equal sharing of responsibilities and decision-making in formulating and coordinating the space industry development programme. Malaysia will also continuously benchmark best practices by other countries and international companies. This will ensure the benefit of private and public investment is maximised for the local space industry and other industries supporting it.

With more players expected to join the industry, the need for better management of assets and initiatives is critical. Malaysia should produce a larger pool of talented individuals and leverage the diaspora that will bring their expertise and experiences back to Malaysia. Complementing this, we need to facilitate capability and capacity development programmes in targeted space technologies and products through the empowerment of local industries and startups.

We are currently experiencing a pivotal moment in the space industry, where more and more countries, including developing nations, are recognising the importance of being involved in space technology and programmes. We can't afford to be left behind! I am excited about the space industry's next ten years and hope our space aspirations will become a reality.



# Looking Up: The Future of Malaysia's Space Landscape



## YBhg Datuk Ts. Dr. Hj. Aminuddin Hassim

Chairman  
Malaysian Space Board

*The Malaysian Space Board was launched to enforce the Malaysian Space Board Act 2022 (Act 834) gazetted in early 2022. Its role is to enact regulations related to the act passed to govern and advance the nation's space sector per international accords. As a result, Malaysia will join the Philippines as one of the first ASEAN nations to establish a space board. This is exciting news for space enthusiasts, high-technology geeks, and industry players. For this edition, myForesight® has the opportunity to get insights from YBhg Datuk Ts. Dr. Hj. Aminuddin Hassim, Chairman of the Malaysian Space Board, on the space industry, the local space scenario, policies and acts, and how stakeholders can contribute to the national agenda.*

“

*The success of Japan's national space programme has offered Malaysia numerous insights into its own space related endeavours. For over half a century, the Japanese have made great efforts in space development.*

”

## Japan's National Space Programme

The success of Japan's national space programme has offered Malaysia numerous insights into its own space related endeavours. For over half a century, the Japanese have made great efforts in space development—relying only on domestic technologies to develop reliable and cost-effective launch vehicles, record consecutive successful launches, and venture into space exploration. Their early realisation of the significance of spaceworthiness prompted Japan to be an original party to the **Outer Space Treaty**, formally the Treaty on 'Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies' in 1967. They are also one of the signatories to the Artemis Accords, a non-binding multilateral arrangement between the United States government and other world governments, which addresses the international principles for exploring and exploiting space resources.

The country has also ratified four United Nations treaties, namely the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space 1968, the Convention on International Liability for Damage Caused by Space Objects 1972, and the Convention on Registration of Objects Launched into Outer Space 1975. In 2008, Japan **enacted their Basic Space Law**, creating a basic framework for space development and utilisation. It was a significant turning point in the history of their space development as it was the first national law providing general provisions for space development use in Japan, putting them at par with other leading spacefaring countries.

Upon the enactment of the law, the Strategic Headquarters for National Space Policy was established as the highest decision-making body for national space policy. The National

Space Policy Secretariat was created in 2012 within the Cabinet Office, playing the coordinator of space policies and space-related activities. **The Committee on National Space Policy**, with members from industry, academia, and other experts, was also formed in the same year as the advisor to the Secretariat. In 2016, they **enacted the Space Activities Act**, which establishes general rules for the launch and control of satellites, and the Remote Sensing Act, which regulates remote sensing activities.

## Learning from Japan

We can draw lessons from Japan, especially on the significance of strategic collaboration and international diplomacy in the peaceful use and exploration of space. The United Nations Office for Outer Space Affairs (UNOOSA) promotes these agendas. It provides a platform for experience and expert sharing for member states, capacity development on space policy and space law, as well as guidelines for the long-term sustainability of outer space activities. Malaysia is grateful to be acknowledged by the UNOOSA as one of the leading drivers in the new chapter of space activities.

I believe that Malaysia must **adhere to international instruments, rules, and norms to defend Malaysia's right to use space to maintain continuous space capacity at an affordable cost**. Malaysia has so far ratified two of the five accords, with three more soon to be signed. The initiative to

The synergy between stakeholders comprised of decision-makers, academia, experts, and industry plays an important role in contributing to the success of any national space programme.

complete this process is documented in the Malaysia Space Exploration (MSE 2030) Blueprint and is projected to be concluded in 2030.

Another aspect that Japan has taught us is **the importance of National Space Policy and Space Law, including good governance** to ensure they are regulated and enforced effectively. Our National Space Policy was established in 2017, and five years later, the Malaysia Space Act was enacted—including the formation of the Malaysia Space Board and the Space Regulatory Division. The National Space Committee (JANGKA) is chaired by the Minister of Science, Technology, and Innovation to coordinate national space activities and centralise all related resources. These initiatives are imperative to expedite the operation, research and development, as well as technology development in the space sector.

Last but not least, the **synergy between stakeholders comprised of decision-makers, academia, experts, and industry** plays an important role in contributing to the success of any national space programme. Therefore, in recognition of the global development of the space industry and its international circumstances, Malaysia will be publishing our own Space Industry Strategic Plan (SISP2030) to create a holistic and resilient space industry with greater growth across the industry's value chain through the adoption of advanced innovative technology, sustainable funding, robust workforce and efficient governance.



## The National Space Act

The Government has gazetted the Malaysian Space Board Act 2022 (Act 834) on 22 January 2022 to strengthen the space sector governance. It covers **four pillars: governance; authorisation regime; supervision and regulation; and indemnification and liability**. The enactment of the Act is in line with Thrust 1 of National Space Policy 2030, namely Strengthen the Governance to Optimise the Access to Space Capabilities, and emphasis is given to the safety aspect or spaceworthiness to ensure the nation's space activities are carried out responsibly, safely, securely and adhere to all international legal regime.

Looking at the global scenario, major spacefaring nations have domestic laws governing their space activities, which also indicates that they are responsible space actors. This, in turn, enables them to be parties to United Nations Space Treaties. This multilateral agreement provides

guidance and rules for all member states to conduct space activities safely and sustainably. With the domestic Space Act and Malaysia's intention to ratify the United Nations Outer Space Treaties, Malaysia is now eligible to lawfully conduct its own space activities within Malaysian territory and support the "United Nations Space 2030 Agenda" as well as UN guidelines such as the "Long-Term Sustainability of Outer Space Activities".

The Malaysian Space Board Act 2022 is anticipated to have a transformative impact on the nation's economy, innovation, and talent. It will provide a framework for the Malaysian space industry's growth that could create new opportunities for businesses, entrepreneurs, and skilled workers. In order to increase investor trust and ensure that the activities they want to invest in are subject to clear norms and regulations, a supportive domestic legal structure for the space industry is essential.

## Economic Growth

Space is vital in terms of the world economy, strategic thinking, terrestrial military strategy, geopolitics, human rights, commercial enterprise, technological innovation and, frankly, the future of humankind. But venturing into space activities, especially the upstream sector, is expensive due to the cutting-edge technology used in space exploration and the enormous risks involved in space endeavours. The establishment of Act 834 provides legal predictability to support commercial investment by reducing the uncertainty faced by the industry player when conducting space activities in Malaysia. **Legal assurance is fundamental in attracting interest from private investors in the New Space era.**

Apart from the legal clarity, the enactment of Act 834 also provides administration and technical transparency in the governance of space activities in Malaysia. The space activities authorisation regime is created under the Act and spearheaded by the Malaysian Space

## The Malaysian government still exerts the greatest influence over the country's space programmes.

Board. Related Regulations, which will outline details of operating the authorisation regime under the Act, are currently being drafted. All the elements mentioned should **promote good transparency in space sector governance, which will boost potential investors' confidence.**

### Expedite Innovation and Talents

The Malaysian government still exerts the greatest influence over the country's space programmes. It is anticipated that the space programme will soon shift from being run by the government to being run by the private sector, including international investors. The enactment of Act 834 is expected to be the pull factor in attracting these players to upgrade their existing aviation capabilities into space capabilities. **New and wider participation of private investments in the local space industry** is expected to spur economic growth in the country, leading to more **market-driven innovation and new job opportunities. Increased employment opportunities in the space sector will help attract and retain local talent**, essential in building a skilled workforce and fostering innovation and creativity.

### Aspiration and Participation of Stakeholders

With the establishment and enforcement of Act 834, Malaysia aspires to become a **responsible nation in the peaceful use of outer space** by ensuring that national

space activities, including those conducted by the private sector, follow international space law principles.

All the **stakeholders, whether from the government, industry, or academia, shall play their roles to ensure the fulfilment of spaceworthiness requirements under the Act. Through the Malaysian Space Board and other regulators, the government shall authorise only qualified space activities and conduct continuous monitoring and supervision of space activities** until the end of the lifecycle to create a sustainable space ecosystem. **The industry shall demonstrate that their planned space activities follow the safety and security requirements** of the Act. **Academia shall develop and strengthen human capital capabilities** to provide expertise, knowledge, and skills to ensure national space activities' sustainability.

### The Future of Malaysia's Space Landscape

On the future of Malaysia's space landscape, I foresee that the future of the space segment ecosystem in Malaysia will develop rapidly in the next 10 years and subsequently become more diverse. The application of space technology will be applied at all levels of government agencies and in the private sector alongside the **boom of the upstream and downstream local space industry**, including the manufacturing of space components and the spinoffs of space technology applications. Not limited to that, this may include creating novel ideas such as artificial intelligence, robotics,

and bioengineering and developing innovative applications for space-related data. A promising future for space exploration and development in Malaysia as the country's space landscape continues to change.

I believe that our local expertise will enable Malaysia to be the **centre of excellence in assembly, integration, and test (AIT)** for small to medium size satellites for the ASEAN region. Malaysia aspires to be the **leader in space law practice in Southeast Asia** and become one of the **top three countries in Southeast Asia** in terms of space technology research and development, as well as achieve **50% self-reliance in space technology** by 2030.

Based on thorough planning and implementation by the Malaysian Space Agency (MYSA) through the MSE 2030, The Space Industry Strategic Plan 2030 (SISP 2030), and the Malaysian Space Board Act 2022 (Act 834), Malaysia should not fall behind in the space technology race. We should seize the opportunity to develop our local space industry. This feat seems far-fetched without significant government support and smart local and international collaborations with the commercial sector. We hope to see more professionals, especially those from startups and spinoff businesses, among the local talent collaborating with the government to propose new initiatives or joint ventures which will hasten the growth of Malaysia's space industry.

In addition, I anticipate that the income from the space sector could contribute up to **RM10 billion or 1% of the country's GDP**, and the space ecosystem could **create up to 5,000 highly skilled job** opportunities for Malaysians.



IN PERSON WITH

# Empowering Malaysia's Space Industry: Challenges & Opportunities

**Tuan Haji Azlikamil Napiah**

Director General  
Malaysian Space Agency (MYSA)



*Azlikamil Napiah became the Director General of the Malaysian Space Agency (MYSA) in May 2019 after serving as Director General of the Malaysian Remote Sensing Agency from 2015 to 2019. Since his first involvement as a researcher in 1994, he has had more than 29 years of substantial knowledge in space technology and its applications. He played a key role in the establishment of Malaysia downstream space infrastructure and related activities, the Malaysian Space Act 2022, and the implementation of the National Space Policy (ISP) 2030.*

*Azlikamil began his career as a researcher at the Malaysian Centre for Remote Sensing (MACRES) in August 1994. Since then, he has consistently contributed his expertise to the research, creation, and management of Malaysia's space industry. This covers space earth observation, communication, navigation, and other associated space activities. He also oversees MYSA's strategic planning and champions space technology as a driver of economic growth.*

*It gives us pleasure to highlight Tuan Haji Azlikamil's priceless knowledge and proficiency in this edition.*

## Driving national space aspirations

The Malaysian Space Agency, or MYSA, is a fully government-owned department under the Ministry of Science, Technology, and Innovation (MOSTI). Our goal is to significantly influence the advancement of space technology to support the growth and prosperity of the nation. In order to accomplish this, we need a robust ecosystem supporting the space sector. Due to this, the National Space Policy 2030 was created in 2017, focusing on 5 areas of thrust.

The 5 thrusts include strengthening space administration, space infrastructure and application empowerment, further developing capacity or expertise in space science and technology, creating space impact on the country's economy and prosperity, and strengthening international strategic collaboration. It is time for Malaysia to transition from its current position as a space technology user, which we have been doing since the late 1980s, to that of a prospective creator or innovator in the field of space-related industries in the coming future.

We recognise the necessity for Malaysia to engage in and seize opportunities to benefit the public and advance national development in light of the increasing global rise of technology. As a result, we believe that in the not-too-distant future, as we are already witnessing globally, space

technology will become a new source of the economy. Our goal is to create space technology that can become a new source of the Malaysian economy over the next ten years. We aim to take an active role in space technology internationally and become one of the top three in Southeast Asia in space technology development services or manufacturing.

Another area we want to focus on is commercialisation, with an emphasis on how space technology and its uses may benefit our culture and people. Over the last 20 years, Malaysia has progressed from being a technology user to being a regional leader in space technology thanks to its capacity of local experts and infrastructure development. Active space downstream activities in the pipeline include the 50 system applications created for end-users, including more than 70 government entities, the space ground segment services for data, information, testing and satellite control, and research and development in space-related technology.

We trust that the potential of space technology in Malaysia can be extended to new services and innovations, including launch and rocket launching services. We benefit from Malaysia's advantageous geography and geographic location in this regard. A further possibility for assuring the sustainability of local expertise is provided by the sheer number of universities in Malaysia and the space technology-related topics they provide.

Our ultimate aim is to empower the aerospace industry in Malaysia to evolve to a level that meets space specifications and to create new space technology services that will open up new opportunities for the growth of our people, economy, and national development.

## Calling all collaborators

There are five main goals that must be implemented in order to carry out the National Space Policy 2030. I am thrilled to share with you some of the achievements thus far.

Firstly, we have created a single ecosystem to oversee all space-related activities through the establishment of the Malaysian Space Agency itself. This effort has successfully brought together numerous entities, which were previously working in isolation, to collaborate and optimise resources.

Secondly, we have also established the National Space Act, which provides the legal framework for space technology development and operations in Malaysia. With regard to the spaceworthiness component in particular, this makes Malaysia one of the earliest Southeast Asian nations to have such legislation in place.

With these foundations in place, space technology could become a significant contributor to Malaysia's economy in the next decade. Our target is for the space technology ecosystem to contribute at least 1% of the national GDP by 2031, equivalent to approximately 10 billion Ringgit. We also aim to create at least 5,000 job opportunities in the space sector.

Our plan is to accumulate a comprehensive space application system, aiming to achieve at least 90% coverage by 2030. This will involve the development of various problem solutions to benefit our country, including natural resource monitoring and management.



We need strategic collaboration and support from various stakeholders to achieve these goals. We must strengthen local industry's skills in fields like payload, manufacturing, and ICT and leverage international cooperation for fast-tracked development. In addition, we must establish a conducive ecosystem for investment and commercialisation in the space industry.

Finally, there is significant potential for the development of space-related services, such as data, GNSS, and communication services, which can be leveraged between stakeholders and the local industry. With all these efforts combined, we are optimistic about Malaysia's future as a major player in the space industry.

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We recognise the necessity for Malaysia to engage in and seize opportunities to benefit the public and advance national development in light of the increasing global rise of technology.

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### Looking ahead for the next 10 years

One of our primary objectives is to promote self-reliance in space technology for Malaysia, with the goal of achieving at least 50% by 2030. We have made significant strides in downstream activities and are currently engaged in midstream activities but have yet to explore upstream activities. In the near future, we intend for at least half of the space-related components or technology to be locally manufactured, operated, and created as a new service.

Another important objective is ensuring that space activities contribute to the nation's economy. While midstream activities include services related to ground-receiving stations and satellite operations, downstream activities can boost the economy through application and problem-solving. Exploring upstream activities can create even more economic value, including the development of commercial services and innovative space-related operations.

Space technology will play a crucial role in the post-COVID era by providing solutions for human life in the future. Regarding research and development, we want to establish Malaysia as a country that can develop its space technology innovation hub within the next ten years. This will ensure the sustainability of our local industry, capacity, experts, and economy. Our primary focus is on making investments in technologies that will benefit the nation long term.

Each nation has its own unique strengths in space technology, be it development, operation, or manufacturing. Türkiye, for example, uses a co-creation approach and is skilled at creating new technology innovations for manufacturing and operation. Some countries, including Russia, Ukraine, Japan, and India, excel in launching services. However, Malaysia is interested in exploring new approaches to launching cost-effective services that do not require huge infrastructure.

Our collaborative approach is selective and strategic, with an emphasis on identifying partners who can contribute in ways that are complementary to our objectives. For instance, since Japan is the only nation currently providing us with this opportunity, we are working with the Japan Aerospace Exploration Agency (JAXA) to access the ISS. Overall, our investment in space technology is intended to bring long-term returns to Malaysia.

One challenge we face is to ensure that certain objectives can be accomplished in the next ten years in terms of research and development (R&D). First and foremost, we must ensure that current activities, particularly those that are downstream, are maintained. This calls for supplying our end-users with continuous information and opportunity. Secondly, in order to manage the continuity of the downstream activity and prevent potential issues that may arise from relying entirely on global suppliers, we also need to develop our own expertise in upstream activity. Thirdly, as this offers the best chance for a return on investment, we must focus on empowering our services.

I believe we can do this by enrolling for data services, ground-receiving operation services, and upstream services. These three inputs are crucial and highly relevant and we predict that demand for them will be high over the next ten years.



IN PERSON WITH

# BAMBOO ON THE MOON

**YBhg Emerita Professor  
Tan Sri Dr. Mazlan Othman**

Senior Fellow  
Academy of Sciences Malaysia



*Tan Sri Mazlan Othman, a distinguished Malaysian astrophysicist and trailblazer, served as the esteemed Director of the United Nations Office for Outer Space Affairs (UNOOSA). Breaking barriers as the first female leader of the agency, she has been instrumental in fostering global collaboration and advancing peaceful space exploration. With her vast knowledge and passion for science, she continues to inspire and share groundbreaking ideas about the mysteries of outer space. Let's explore her latest insights on outer space!*

## Innovation Ideas in Space Technology

There are several trends in satellite technologies that are currently gaining traction. One area is additive manufacturing, which involves using 3D printing technology to produce satellite components. Another trend is advanced ground systems, which involve receiving signals, such as images and telecommunications, from satellites. Additionally, there is a growing interest in advanced payload systems that utilise artificial intelligence. Flexible launch services and small satellites—such as nanosats and cubesats—are also popular. Another area of focus of innovation within satellite technologies is spacecraft propulsion, which is different from rocket propulsion used for launching spacecraft into space. There are many innovations happening in this area, and it's an important aspect of developing more efficient and effective satellites.

Another trend that we're seeing in satellite technologies is the development of very high-throughput satellites. These are satellites that are highly efficient and can handle

large amounts of data. One really exciting development is the emergence of in-orbit services, where satellites are designed to service other satellites in space. For example, they can bring fuel to old satellites that need a refill or replace failing batteries. This is definitely a trend to watch for in the future.

When it comes to the specific technologies that Malaysia is interested in, we need to be systematic in identifying who should be doing what. Startups like ALIENA, a Singapore-based company that specialises in propulsion systems, demonstrate that even small countries can contribute to the space industry. However, there are still limitations to what we can do locally, so we may need to partner with overseas companies.

Ultimately, agencies like MIGHT and the Malaysian Space Agency need to keep abreast of the latest trends in satellite technologies and identify potential areas of innovation. Looking to the future, it's also worth considering the long-term possibilities for the pursuit of astronomy suitable for Malaysia's needs and capabilities and cosmology research which may offer clues and ideas for future innovations.

## Learning From Others

The resources for space technology development in Malaysia are indeed currently limited and it is important to systematically identify the country's capabilities. Let's take a look at Singapore: they have made advancements in space technology despite limited resources and have a strong presence in the industry.

Back in 2004, we were already developing our own Satellites' Assembly Integration and Test (AIT) facilities, allowing us to build satellites in our own country. This led to other developing countries feeling left behind by Malaysia. However, in recent times, other countries have been catching up.

It is important to have foresight and put in place a strategy for the development of space technology, and the government must invest in the industry. The space sector is still government-driven, and the government must provide incentives for the private sector to invest.

When I started the space agency, I had to initiate the development of the necessary infrastructure, including training programmes and educational institutions that focused on aerospace, and local universities set up faculties to further these aims. To sustain interest and drive innovation in technology, I worked with the government to design and build satellites, which served as an investment in this field. I made a point of ensuring that our local engineers were involved in the process, particularly during the creation of RazakSAT, so that they could develop the required technologies. Working alongside Korea, we reached an agreement whereby our engineers would receive all proprietary information and share any intellectual property rights with them.

Collaboration between the government and private sector is key in driving the development of space technology. The private sector has the financial resources while the government provides the necessary incentives, policies, and funding to support the industry.

In the US, for example, while the private sector has played a major role in space technology development, NASA still plays a critical role in providing funding and support to private companies such as SpaceX and Boeing. Similarly, in India and China, the government is the primary driving force behind the development of their space programmes.

Overall, it is clear that the development of space technology requires a collaborative effort between the government and private sector, with each playing a critical role in driving innovation and progress.

## Space Technology Transforming Civilisation

What space technology can bring about is truly civilisation-altering. For example, if we manage to inhabit Mars, that would have a major impact on the human race. Additionally, the ability to mine for resources in space would have a significant impact on the economy. These are rather big and important ones.

*Talking about sustainability,  
I am presenting a proposal  
to bring bamboo to space,  
specifically to plant bamboo on  
the Moon.*

Small satellites, the size of thumbnails, are becoming more common, and soon we'll be talking about satellite swarms. The beauty of these small satellites is that they don't require large capabilities individually. By launching 1,000 of these satellites, we can use AI and swarm analysis to control their flying formation and change their shape and capabilities as needed. This opens up endless possibilities in terms of the use of these satellites, and it's a very exciting field. So, what's next?

Talking about sustainability, I am presenting a proposal to bring bamboo to space, specifically to plant bamboo on the Moon. This is a crazy idea, but hopefully, it will get some response from the China research team. The idea is to see whether bamboo can be grown in lunar soil. Bamboo is grass, meaning it doesn't require extremely fertile conditions to grow, and it's the fastest-growing plant on earth. There are thousands of species of bamboo with a wide range of uses, from construction and furniture to textiles and tea. If successful, we could harvest bamboo to make buildings on the Moon within three to five years. Our research is currently focused on identifying the best species of bamboo that would thrive in space, given the unique conditions.

Bamboo is hardier than steel, very light, and has high oxygen-generating capability. Malaysia could be a leader in the production of tropical bamboo, even though China is the world's largest exporter of bamboo. By developing the idea of planting bamboo in space, we could potentially revolutionise the use of sustainable materials in construction and promote tropical bamboo engineering. Plus, bamboo is a cultural icon for many countries in Asia and bringing cultural elements to space is important for our sense of adaptedness and well-being. This is a crazy idea, but one that I believe could have a huge impact.



IN PERSON WITH

A  
Glimpse  
at the

# Turkish Aerospace Industry

## Professor Temel KOTİL

President & CEO  
Turkish Aerospace Industries

*Professor Temel Kotil is a renowned figure in the aerospace industry and currently the President and CEO of Turkish Aerospace Industries. With over 30 years of experience in the fields of aeronautics and astronautics, he has also held key leadership roles in the defense and aerospace industry, such as the Chairman of the Board of Directors of SASAD and TEI and served in various academic positions. His vast knowledge and experience will undoubtedly provide valuable insights into the aerospace sector, not only in Türkiye but also globally. It is a pleasure to feature Professor Kotil's valuable experience and expertise in this edition.*

## The high technology landscape in Türkiye today, particularly in the field of aerospace technology

In 2023, The Republic of Türkiye will mark its 100th anniversary. The goal of our President Recep Tayyip Erdogan, known as "Türkiye's Century", aims to advance technology in a variety of sectors, including automotive, defence and other industries. In the sector of defence, our organisation performs this process with aircraft, helicopters, UAVs and space technology.

Although we started much later than our competitors, as a nation, we achieved technology adaptation in a short period by closely monitoring global development. Besides producing a fifth-generation Turkish Fighter, we also manufactured the ATAK 2 Heavy Duty Attack Helicopter, the ANKA-3 Unmanned Aerial Vehicle (UAV), and the HÜRJET jet training and light attack training aircraft that we will soon introduce to the world. These aircraft are supported by cutting-edge technological infrastructure that Türkiye has invested in for the past 15 years.



We aim to integrate this technology with the most recent advancements other nations are adopting. Let's take the Turkish fighter jet as an example. It will have the capability of increased air-to-air engagement ranges with Novel Weapons, precise and accurate weapon firing from internal weapon bays at high/supersonic speed and augmented lethality with the aid of Artificial Intelligence and Neural Networks.

We develop our technologies at the Turkish Aerospace plant using cutting-edge technological infrastructure. The Presidency of Defence Industries also invested in aircraft infrastructure technology, enabling us to adapt quickly. These efforts are significantly influencing Türkiye's rapidly expanding defence industry. As of right now, Türkiye is ranked 67th out of the top 100 global corporations in 2022.

## On managing upcoming young talent, either in the aerospace industry or other sectors

Turkish Aerospace is a member of the Turkish Armed Forces Foundation (TAFF). The projects that we develop here incorporate the newest technological advances in aircraft in collaboration with other significant companies like ASELSAN, HAVELSAN, and ROKETSAN, who are technological leaders in various industries in Türkiye. Additionally, we partner with countries worldwide, providing production support for A400M and specialised Boeing fuselage.

We work with the Ministry of National Schools to draw young, brilliant engineers to the defence industry. For this reason, all our pre-university students are considered potential engineering candidates. They are given relevant exposure

even before attending grade school to create interest, which will later turn into added value to our country when we are able to raise future engineers.

Other initiatives include TEKNOFEST festivals that take place annually in various Turkish cities. Visitors are able to experience numerous technologies and simulation experience areas and access detailed information about the latest advancements. They feature displays of air vehicles developed with national facilities such as Turkish Stars, SOLOTÜRK aerobatic teams, AKINCI, HÜRKUŞ and ATAK Helicopter, presented to people of all age groups, especially the young.

In order to fully inspire and motivate our young minds who attend high school, special tours are regularly arranged for them. Apart from the efforts mentioned, we are also actively seeking highly skilled and promising third and fourth-year university students in addition to university graduates. The Engineer Development Program (MGP)—a 16-week programme consisting of an intensive training curriculum that allows young engineers from different work disciplines to collaborate in aircraft manufacturing—has been established to fully prepare recently graduated engineers for the workforce.

Today, our company welcomes over 3,500 interns annually and currently has 14,000 people working in it. One of our key objectives is to raise this number to 25,000 as our competitors have reached 50,000-60,000 engineers and technicians worldwide.



## On the impact of locally developed technology in the economy, policy development and social context

Türkiye has made large investments in the space industry over the last 20 years allowing us to now carry out the Space Systems Integration and Test (USET) centre satellite tests in our own facility. Both the **GÖKTÜRK Replacement** observation satellite and the **TÜRKSAT 6A** communication satellite tests are still ongoing at our site.

Another observation satellite, IMECE, was completed and put into orbit on April 15, 2023. There are already more than 6,000 satellites orbiting the Earth, and we are among the seven nations in the world that are able to build and launch our own satellites. Through communication and surveillance, we can instantly keep up with political and economic developments and defend our nation from external threats. Satellites are critical for advancing and disseminating crucial knowledge and allow immediate actions to be taken by acting swiftly in challenging circumstances.

“

*Türkiye has made large investments in the space industry over the last 20 years allowing us to now carry out the Space Systems Integration and Test (USET) centre satellite tests in our own facility.*

”



## Where Technology Drives Business Success

This customary flagship programme is an interactive platform which promotes the visibility of local players and their strengths, also as an avenue to form partnerships among domestic as well as international players, and government entities. The objectives are achieved through panel sessions and dialogues, Talk Series, exhibitions, business meetings and pitching, and high-level stakeholder engagements.

### KEY AREAS



### LET'S COLLABORATE!

Together with our partners from government institutions, small and medium industries, multinational corporations, trade associations, universities, and investors, we strive to support industrial development and promote techno-commercial opportunities for the greater benefit of the nation.



#### EXPERT BRIEFINGS/ TALK SERIES

a series of technology-related talks by experts, policymakers, academia, technopreneurs, NGOs



#### BUSINESS PITCHINGS

promotes development of industry collaboration & ecosystem in the high technology sectors



#### DIALOGUES & NETWORKING

for those who strive to support local industrial development for the benefit of the nation



#### PARTNERSHIPS MOUs/MOAs

Highlight on mutual collaboration between stakeholders



#### TECHNOLOGY SHOWCASES

Promote business opportunities through technology showcases for SMEs and entrepreneurs to stakeholders



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TÜBİTAK

**TURKISH  
AEROSPACE**

by



**Liz Alexander, PhD**  
Futurist. Author. Consultant. Speaker.

*Dr. Liz Alexander has been named one of the world's top female futurists. She combines futures thinking with over 30 years' communications expertise to produce publications that showcase the advice of fellow futurists on issues including the future of education and how businesses can practically benefit from working with the futures community.*

*Dr. Liz is the author/co-author of 22 nonfiction books published worldwide that have reached a million global readers. She has contributed to leading US technology magazine Fast Company and also Psychology Today, and her work has been featured in journals such as Knowledge Futures and World Futures Review. She earned her PhD in Educational Psychology at the University of Texas, Austin.*

# Let's Launch More Moonshot Thinking

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*"I discovered that the beauty isn't out there, it's down here, with all of us. Leaving that behind made my connection to our tiny planet even more profound. It was among the strongest feelings of grief I have ever encountered. The contrast between the vicious coldness of space and the warm nurturing of Earth below filled me with overwhelming sadness."*

- Star Trek star, William Shatner's assessment, after his brief voyage in space<sup>1</sup>.

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On December 24<sup>th</sup> 1968, the world first glimpsed what has since been described as “the most influential environmental photo ever taken.” Known as “Earthrise,” the photo, shot by Apollo 8 astronaut, William Anders, shows part of our beautiful planet rising above the lunar surface against a backdrop of pitch-black space. “We came all the way to explore the Moon, and the most important thing is that we discovered the Earth,” Anders is quoted as saying. Shortly after that picture was broadcast, the burgeoning environmental movement seeking to protect the planet we already live on took off.

I'll be honest with you: I have absolutely no desire to travel into space. What I am grateful for when it comes to space exploration, however, is the way that these efforts have helped to improve life on Earth. And much of that is thanks to what is commonly called “moonshot thinking.”

## Moonshot Thinking

The belief that it is possible to find solutions for huge, seemingly insurmountable problems isn't as common as we might think, even among scientific luminaries. While being interviewed during a Voice of America radio broadcast in 1957 the US inventor of the vacuum tube, Lee de Forest (1873-1961), confidently pronounced that:

*“To place a man in a multi-stage rocket and project him into the controlling gravitational field of the moon, where the passenger can make scientific observations, perhaps land alive, and then return to earth—all that constitutes a wild dream worthy of Jules Verne. I am bold enough to say that such a man-made moon voyage will never occur, regardless of all future scientific advances.”*

A dozen years later, in July 1969, the astronauts of Apollo 11 put paid to that erroneous prediction by safely landing on the moon and returning their craft to Earth. As David Mikkelsen, the founder of the fact-checking website Snopes, points out, “Persons notable for achievements in one field of science aren't necessarily reliable prognosticators about other scientific fields<sup>2</sup>.”

Perhaps Mr. de Forest needed to be more of an absurdist to get his head around the idea of interplanetary travel. But if we're looking to develop moonshot thinking for ourselves and others, what more do we need to know about it?

We came all the way to explore  
the Moon, and the most  
important thing is that we  
discovered the Earth.

William Anders, Apollo 8 Astronaut

## A Quick Definition

Typically nurtured under the roofs of high-tech firms, moonshot thinking appears to have some basic features:

1. The focus is on huge, humanity-changing challenges that may take years or even decades to overcome, without the pressure of realising short-term profitability.
2. Solutions generated are likely to sound as if they belong in a science-fiction story (think using 3D printing to create artificial body parts or training medical students using virtual reality).
3. There must already exist at least a glimmer of some technological breakthrough that can provide a way forward.

To achieve successful and significant moonshots, teams need to be comprised of people who are comfortable with constant, rapid experimentation, failure, and “unlearning” (a topic I explored in my Fast Company article Three Ways to Unlearn Old Habits Faster: <https://www.fastcompany.com/3063112/three-ways-to-unlearn-old-habits-faster>). What also appeals to me about this approach is something Peter H. Diamandis, the founder of the X Prize Foundation and co-founder (with Ray Kurzweil) of Singularity University, has promoted: The “pre-mortem,” meaning that you should try to kill your ideas early on rather than run with them and only later find they are untenable. This reminds me of the quote by theoretical physicist, Richard Feynman, who said, “We are trying to prove ourselves wrong as quickly as possible, because only in that way can we find progress.”

Progress has most certainly been made, not just in advancing humankind's journeys through space and the promise that might offer for the future, but in the spin-off technologies and products that have come about as a result of those breakthroughs.

## Giant Leaps #1

In many cases, innovations that made space exploration safer and more comfortable for astronauts have been directly applied to similar needs here on earth:

- **Filtered water:** Space scientists needed to find a way to provide astronauts with recycled water that didn't taste or smell of chlorine. This led to the creation of electronic water purification units that use silver ions to kill bacteria. This innovation is now applied commercially for swimming pools, fountains, cooling towers and even zoo water enclosures, eliminating the need for harmful, unpleasant chemical sanitisers<sup>3</sup>.
- **Memory Foam:** Imagine the pressure on a human body when undergoing the high-pressure takeoffs and landings involved in Moon missions. Or even the strain from sitting on hardened seats for days on end in a space capsule. The solution to that challenge came from a foam that not only pads seats on spacecraft, but moulds itself to each unique astronaut's body and resumes its shape afterwards. Many of us with aching backs or sleep problems are grateful to the "temper foam" mattresses and pillows that now ease our everyday lives.
- **Polymer protection:** NASA's Apollo 1 craft wasn't built to travel to the Moon, but to orbit the earth. During one of the launch rehearsal tests the cabin caught fire and all three crew members perished. As is often the case, tragedies such as this one are the impetus for new thinking. It became important to find some form of fire-retardant material that could help save the lives of those on board confined spaces, should fires occur in the future. NASA looked into polymer fabric that would protect astronauts under a wide range of temperatures. This same material is used today to protect firefighters around the world, boosted by a further spinoff known as "cool suit technology" used for body vests and helmet liners to help alleviate heat and heat-stress in dangerous circumstances.


## Giant Leaps #2

Even more impressive, in my opinion, are those examples of innovations from space exploration efforts that have been modified and applied in completely different fields. Such as these few examples:

- **Precision prescription doses:** Who would have thought that the process developed to control the flow of propellants from external fuel tanks to the engines of space vehicles could hugely improve the lives of medical patients? Yet the Programmable Implantable Medication System (PIMS) is such an advance. By means of a miniature pump and valve, precise, computer-directed medications such as insulin can be auto-injected into patients' bodies using the telemetry system similar to the one that space scientists use to control the altitude of spacecraft<sup>4</sup>.
- **Robotic arms for surgery:** The technology and thinking that led to the development of Canadian robots that perform "heavy lifting and maintenance" duties on the International Space Station resulted in the neuroArm. "The world's first robot capable of performing surgery inside magnetic resonance imaging machines" allows for surgeries that would otherwise be highly challenging or even impossible for human doctors. This particular moonshot idea has helped to save the lives of patients whose conditions would otherwise have been inoperable on<sup>5</sup>.
- **Artificial limbs:** Different types of specialty rubber products have long been used for space craft, including polyurethane foams for thermal insulation, vibration isolators, as well as various rings, nozzles, and seals. In India, the Vikram Sarabhai Space Center manufactured a special polyurethane for the Indian Space Research Organisation's (ISRO's) rockets that was later used to improve upon existing artificial foot prosthetics. After extensive medical trials, these artificial limbs are now made available, free of charge, to disabled people in 27 countries around the world. Known as the "Jaipur foot," this lightweight prosthetic enables below-knee amputees in rural areas to continue working, especially in wet conditions such as paddy fields<sup>6</sup>.

## Terra Firma

What each of the above examples demonstrate, along with the list of other moonshot inventions listed in the Boxout (see *next page*), is the value of collaboration between space scientists and technicians, medical laboratories, and commercial enterprises. As with every creative endeavour, there is enormous value in cross-fertilising ideas with people who work in very different fields and environments.

As the idea of contributing to, or even taking part in, space travel ignites the imaginations of young people entering STEM programmes today, we can hopefully look forward to even more earth-shattering moonshot spin-off ideas. As well as the thinking behind them, that helps to save lives, sustain our environment, and keep us healthier and happier here on Earth. 

## BOXOUT: Who Knew?

Venturing into space hasn't just changed people's perceptions about the importance of protecting our vulnerable and beautiful planet, it has helped to inspire all sorts of technologies and inventions that benefit our everyday lives. Here are 12 further examples. How many were you already aware of?

- 1 Cordless drills, whose innovative development expanded to include medical devices and vacuum cleaners
- 2 Scratch-resistant lenses for sunglasses and prescription lenses
- 3 Photovoltaic solar cells
- 4 Shock absorbers that protect buildings and bridges in earthquake zones
- 5 Wireless headsets
- 6 SatNav in your car or other vehicles
- 7 Cell phone cameras
- 8 Lighter, more efficient breathing masks for firefighters
- 9 Needle biopsies
- 10 Safety grooves on airport runways, major roads, bridges etc. that help contribute to huge reduction in accidents
- 11 Handheld emergency rescue tools known as Lifeshears that can be used to free people trapped in crashed cars or buildings
- 12 Invisible teeth braces

Source:  
<https://www.nasa.gov/offices/oct/40-years-ofnasa-spinoff>

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# Building Space Interest & Literacy Among the **Younger Generation**

*Apadilangit is a space education startup that focuses on building Asian space leaders and talent while promoting a dynamic and engaging space education strategy for students, teachers, and the public. By igniting a passion for science and space exploration in children, the goal is to shape the future of space outreach and inspire the next generation of space professionals to further drive the space economy in Malaysia.*

“

*Space holds the key to solving some of the biggest enigmas of the world, from the stars that illuminate the night sky to the cosmic forces that created the universe.*

”

Humanity has long been fascinated and awestruck by outer space and galaxies, the vast and seemingly limitless expanse beyond our planet. The Karman Line, which sits about 100 kilometres above Earth's surface, is generally accepted as the boundary where Earth ends and outer space begins. Space holds the key to solving some of the biggest enigmas of the world, from the stars that illuminate the night sky to the cosmic forces that created the universe. Modern technology has allowed us to make incredible strides in our understanding of space; however, there is still a vast amount of uncharted territory to discover and explore. The final frontier of space exploration missions has numerous prospects for growth and discovery.

## The Significance of Space Education

Space has always been a source of inspiration to explorers and scientists. From physics to chemistry, to material sciences and engineering, the pursuit of space has produced revolutionary technologies and vastly broadened humankind's scientific knowledge.

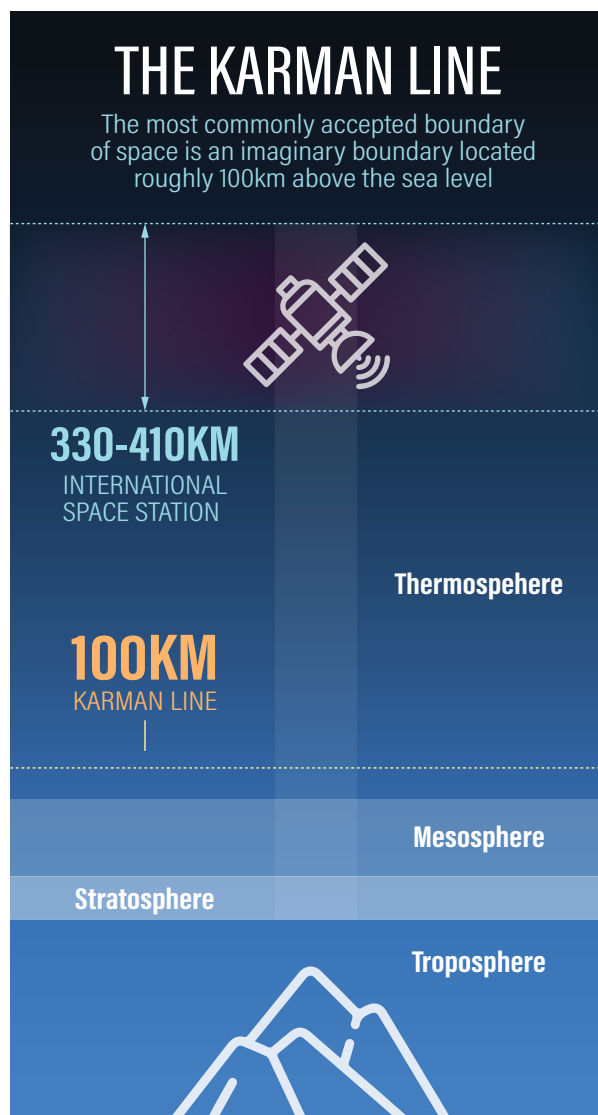
Space education plays a critical role in the growth of the space economy by producing skilled professionals and fostering innovation. Investment in space education can lead to the development of new technologies and advancements in the industry, which can contribute to the growth of the space economy. Today, discoveries in outer space are rapidly accelerating, where the space industry has created an exciting new paradigm that includes new players, trends, opportunities, and challenges—all propped up by the convergence of advanced technologies that are a part of the ongoing, broader Fourth Industrial Revolution (4IR).

OECD defines the term “space economy” as the entire range of activities and resource uses that provide value and benefits for humans throughout space exploration, study, knowledge, management, and utilisation, including Space Education—which is essential in fostering national space talent<sup>1</sup>. In the Space Report 2022, the Space Foundation estimated that the space economy was worth \$469 billion in 2021<sup>2</sup>.

Over the last two decades, the private sector has played an increasingly important role in other spacefaring countries within the global space economy. Companies like SpaceX, Blue Origin, and Arianespace have revolutionised the space sector by reducing costs and turnaround time with innovation and advanced technology. This echoes to Asean countries where government expenditure on space applications has increased significantly in the last decade<sup>3</sup> and the demand for space talent becomes crucial and apparent.

In Malaysia, the development of national space talent is emphasised in the third core of Malaysia Space Exploration 2030 (Malaysia Space-X 2030)<sup>4</sup> to further develop local space talent and enable growth in the local space industry. Government is projecting 5,000 space related jobs by 2030 and up to RM10 billion contribution to the country's Gross Domestic Product (GDP)<sup>5</sup>.

Exposure to space education is necessary to ignite the youth's interest in space and STEM to increase local space talent. Space literacy aids in developing the youth's understanding of space-related concepts, technologies, and activities. Knowledge of space science and technology can lead to the creation of new technologies and discoveries across industries, including earth sustainability, security, communication, transportation, healthcare, climate change



and space debris mitigation. Space literacy plays a critical role in inspiring and motivating the next generation of scientists, engineers, researchers, space lawyers, space doctors and space entrepreneurs.

The current emphasis of space education in Malaysia is only on upper secondary and university students, leaving primary and lower secondary school children in a disparate situation. Early exposure to space science and technology stimulates children's interest and attention, providing significant developmental advantages by motivating them to learn more and sparking a passion for science and space that lasts a lifetime.

Learning about outer space can help young children develop critical thinking skills, including observation, analysis, and problem-solving, which would also be valuable in other aspects of their lives. Furthermore, space education fosters creativity and innovation, as space exploration necessitates these abilities. By learning to think outside the box, come up with new ideas, and problem-solve in unique ways, children can become better prepared for the challenges they will face in the future.

Advancements in approaches and education technology have opened new avenues for space education. Interactive space camps, virtual reality, simulation-based learning, and online courses provide students with a more immersive and engaging learning experience, helping them understand complex space-related concepts and future space missions such as the Artemis mission to the moon.

The economic benefits of space education are significant and play a critical role in the growth of the space economy, particularly in countries with developing space industries. Investment in space education can lead to the development of new technologies and advancements in the industry, which can contribute to the growth of the space economy by producing skilled professionals and fostering innovation.

The European Space Agency estimates that for each Euro spent in the sector there are six Euros that benefit society<sup>6</sup>. ESA's spending in industry and academia ripple throughout the European economy, supporting vital sectors, creating new businesses and jobs, and attracting students to science and engineering.

The United Arab Emirates (UAE) has made significant investments in its space education industry and is now home to several space-related corporations in the Middle East, including satellite companies and space research institutions. While in East Asia, the National Astronomical Research Institute of Thailand (NARIT) spent 78 million baht (RM 10 million) on education and space outreach in 2022<sup>7</sup>.

In conclusion, space education is a critical component of the growth of the space economy. As we continue to explore the universe and push the boundaries of space, it is essential that we invest in educating the next generation of space professionals. This investment will not only lead to the development of new technologies and advancements in the industry but will also provide opportunities for job creation and economic growth.

Furthermore, space education investments can promote international cooperation and collaboration in space exploration through knowledge- and resource-sharing. Countries can work together towards the common goal of furthering our understanding of the universe. As we face global challenges such as climate change and resource depletion, investing in space education and utilising space-based technologies is imperative in finding solutions. By doing so, we can foster innovation, create jobs, drive economic growth, and work towards a better future for all.



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## CURRENT INDUSTRY SCENARIO: SHIPBUILDING & SHIP REPAIR (SBSR) INDUSTRY IN MALAYSIA



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The shipbuilding and ship repair industry in Malaysia has a long history dating back to the 19th century, and it has been identified as one of the critical sectors for the country's economic growth.

In the 1970s, Malaysia began to invest in the construction of oil and gas exploration and production facilities, which led to the establishment of several shipyards specialising in offshore support vessels.

Today, the shipbuilding industry in Malaysia continues to thrive, with various shipyards generating economic multiplier effects.

Modern seagoing vessel and marine equipment manufacturers and corporations that offer related services—including ship repair, design, vessel upgrade/conversion, and maintenance, repair and overhaul—are all included in the Malaysian shipbuilding and ship repair (SBSR) sub-sector.

## Overview of the Global Shipbuilding Market

OECD secretariat analyses selected shipbuilding market developments in these eleven economies: China, Philippines, Vietnam, Indonesia, France, Chinese Taipei, United States, Russia, Spain, Malaysia and Bangladesh.

Malaysia completed about 0.37 million of CGT while getting contracts of about 0.24 million CGT.

## Completions and new contracts of seagoing vessels in terms of CGT by selected economies, 2018-2021

COMPLETIONS			CONTRACTS		
	Economy	Million CGT		Economy	Million CGT
1	China	44.3	1	China	52.15
2	Vietnam	1.76	2	Russia	1.93
3	Philippines	1.69	3	Vietnam	1.38
4	Indonesia	1.44	4	Philippines	1.11
5	Chinese Taipei	0.74	5	Indonesia	0.69
6	United States	0.68	6	Chinese Taipei	0.46
7	Russia	0.66	7	United States	0.31
8	Malaysia	0.37	8	Spain	0.25
9	Bangladesh	0.37	9	Malaysia	0.24
10	Spain	0.36	10	Bangladesh	0.19
11	France	0.28	11	France	0.16
	Others (29 economies)	2.25		Others (26 economies)	1.33
	<b>Total (40 economies)</b>	<b>54.9</b>		<b>Total (37 economies)</b>	<b>60.19</b>

Note: This table includes all seagoing vessels from 100 GT.  
Source: OECD calculations based on Clarkson Research Services Limited (March 2022), World Fleet Register, <https://www.clarksons.net/wfr>

## State of Play of SBSR Industry in Malaysia

Currently, there are about **32 Shipyards** in Peninsular Malaysia, **64 Shipyards** in Sarawak **12 Shipyards** in Sabah located along the coast of Malaysia

### Shipbuilding Capacity:

Malaysia has a significant shipbuilding capacity, with shipyards in various parts of the country. These shipyards have the capability to build a wide range of vessels known for their price competitiveness, durability and functionality, which includes offshore support vessels (OSV), tugboats, passenger ferries, fishing vessel and yacht (for leisure and tourism).

Among the major players include Malaysia Marine and Heavy Engineering (MMHE), Boustead Naval Shipyard, Shin Yang Shipyard and Berjaya Dockyard.

## Current State of Malaysian SBSR Industry

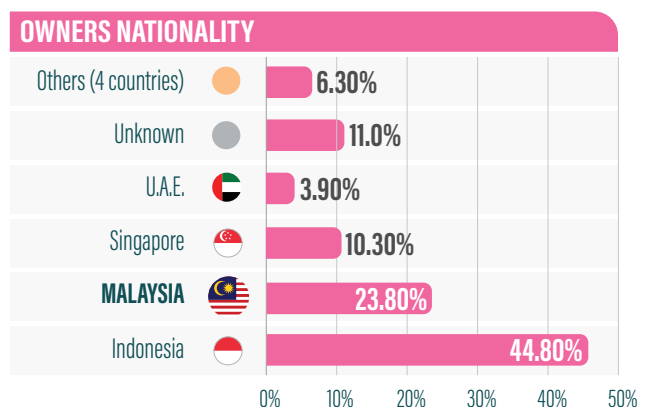
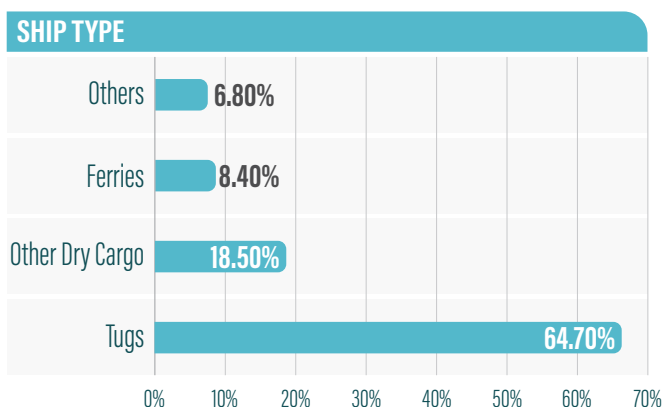
New contracts in Malaysian shipyards by ship types and by ship owner nationalities, 2018 - 2021, in terms of CGT

Recent orders to Malaysian shipyards were concentrated in tugs, accounting for about

**65% of total CGT**

contracted between 2018 and 2021.

**≈79%** of recent orders were from Indonesia, Malaysia and Singapore ship owners.



Note: This Figure includes all seagoing vessels from 100 GT. The percent share is based on CGT.

Source: OECD calculations based on Clarkson Research Services Limited (March 2022), World Fleet Register, <https://www.clarksons.net/wfr>

## OSV

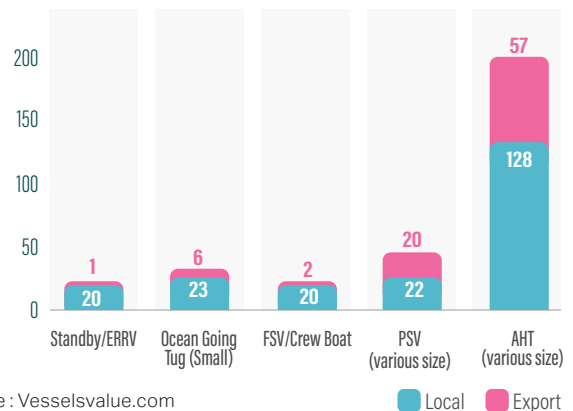
Our Malaysian-made vessels have been exported worldwide, including to Australia, New Zealand, Pacific Islanders (Fiji, Tokelau, New Caledonia), the United Arab Emirates, Qatar, Turkey, Indonesia, Thailand and even Singapore, our closest neighbour.

Malaysian shipyards have built

# >297 OSVs

since 2005 that have been sold worldwide.

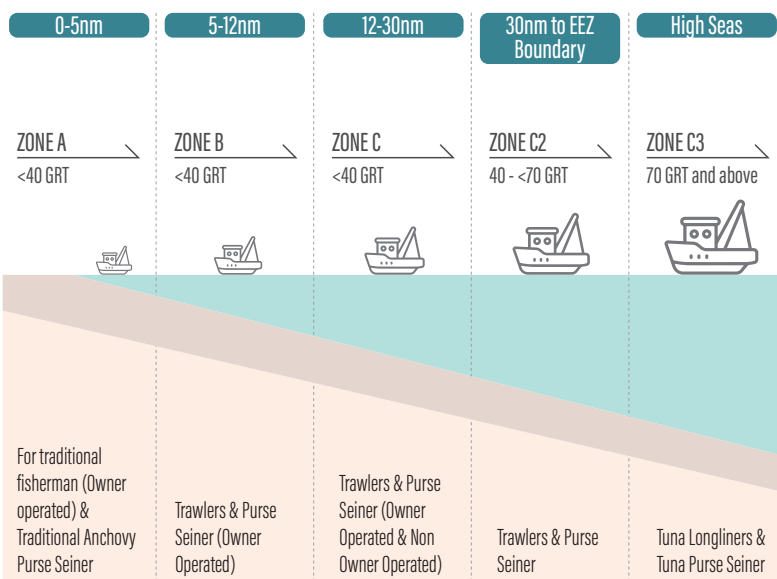
### OSVs Built in Malaysia Since 2005



## Fishing Vessel

### Potential Market in Fishing Vessel for Repair and Building Market

Only 2% of 50,000 fishing vessels are involved in deep-sea fishing (C class and above), while the remaining 98% are involved in inshore fishing.



### Fisheries Industry:

The shipbuilding industry and fisheries industry are interconnected, and we should look at the bigger picture from the food security perspective.

From SBSR's perspective, it provides potential vessel building and repair business that the local shipyard can capitalise on.

The estimation for the ship repair business amounts to RM30 million.

The Department of Fisheries Malaysia still offers new permits for zone C2 and C3. This opens up more opportunities for the potential shipbuilding market.

### Number of Licensed Fishing Vessels (C&C2) By Fisheries State 2021

States	C	C2
Perlis	59	17
Kedah	197	68
Penang	14	21
Perak	721	199
Selangor	219	
Johor	161	85
Pahang	315	41
Terengganu	155	27
Kelantan	66	72
Sarawak	290	46
Sabah	82	39
<b>TOTAL</b>	<b>2279</b>	<b>615</b>

Source : Department of Fisheries

## Potential of the Leisure and Tourism Sector in the SBSR Industry

### Leisure & Tourism

There are

# 31 marinas

located throughout Malaysia's shorelines.

This favourable ecosystem presents abundant

## cross-sector opportunities

for local SBSR and tourism industry players such as yacht rental, maintenance and repair.



Source: MIGHT

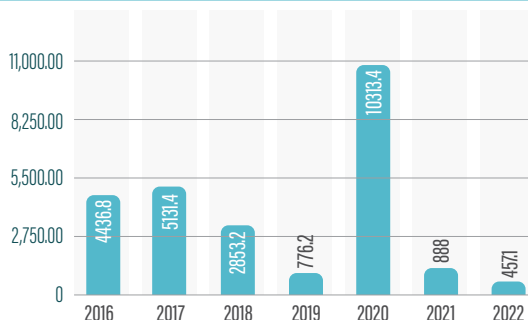
## International Trade of Shipbuilding Industry in Malaysia from 2016 to 2022

### Import and export of the Malaysian Shipbuilding industry

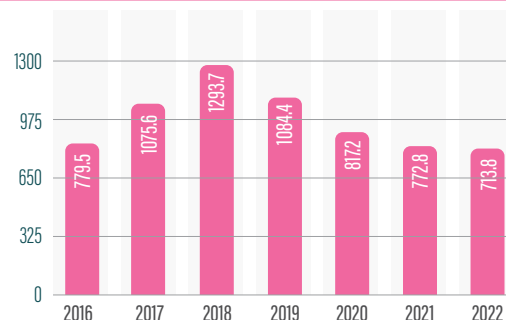
Malaysia's ship import decreased by 39.6% to 457 million in 2022 from RM 888 million in 2021. Major imports are light-vessels, fire-floats, dredgers and floating cranes. The main import countries are Mexico, China, Singapore and the US.

In 2022, export slightly decreased by 1.2% from RM 722 million to RM 713 million. Major exported products were tugboats, pusher craft and yachts, and other vessels for pleasure. Major export countries are Australia, UAE, Indonesia and Singapore.

Import for Shipbuilding Industry 2016-2022 (RM million)






Export for Shipbuilding Industry 2016-2022 (RM million)



Source: DOSM

## Future Undertaking for the Growth of SBSR Industry in Malaysia

	 Description	 Objective	 Impact
SAFINA PROJECT	To build 72 various types of OSV within 5 years to replace aging vessels supporting oil and gas production and exploration	To support the local shipbuilding ecosystem by developing fit-for-purpose OSV for oil and gas industry	RM 3 billion value contracts for ship owners
BONAFIDE STATUS	Bonafide status companies are exempted from sales tax and import duty for certain importation materials, parts and components	To help the industry compete with foreign shipyards on cost competitiveness	To provide a fair playing field for local shipbuilders to compete in the international market
TAX ALLOWANCE	SBSR Industry enjoys a special incentive under Income Tax Act 1967	To promote and attract investments in SBSR's emerging technology	To build industries capabilities and capacities to meet the challenging and competitive global landscapes

The Government and Petronas has introduced several initiative and incentives to further stimulate the growth of SBSR Industry

Source : AMIM, MIGHT & MIDA

## UPSKILLING THE SHIPBUILDING INDUSTRY

### Strengths to Leverage On



# Issues and Challenges in Malaysian SBSR Industry

from the F.I.R.S.T perspectives



## Funding

- Insufficient or uncompetitive municipal financing
- Despite ongoing reform, industry performance and revenue do not accurately reflect actual accomplishments
- High import cost for raw materials and services



## Infrastructure

- Competition from more cost-effective foreign yards e.g. China
- Disruption in international supply chains affecting Malaysia's SBSR industry



## Regulations

- Policymakers are still not taking the growth of this industry seriously
- High dependency on government initiatives in the construction and repair sectors, particularly shipyards in Peninsular Malaysia and Sabah
- Non-transparent government tender and procurement procedures



## Skills & Talent

- SBSR industry labour migration to other industries
- High dependency on foreign workers especially shipyards in East Malaysia
- A mismatch between the industry's perspective of the job scope and the student's skill sets after receiving training by local institutions



## Technology

- Lower productivity resulting from a lack of automation and adoption of new technologies
- Excessive reliance on imported design

## The case for Action to Develop a Malaysian Shipbuilding Ship Repair Industry

### Critical Factors in Malaysian Industry Scenario

#### 1 Naval Sectors & Securities

Opportunity to develop local industries as a result of the government's significant investment (estimated at RM11 billion). Physical protection of territorial integrity has become one of our nation's most important requirements.

#### 2 SAFINA Projects as Catalyst

By replacing ageing vessels servicing Petronas, SAFINA plans to serve as a catalyst for the industry's development via a five-year plan to construct 72 different types of vessels.

#### 3 Food securities in Fisheries Industry

Supporting fisheries industries through the modernisation of local fisherman boats to increase capture fisheries and concurrently improving the standard of living for fishermen.

#### 4 Leisure Industries Potential

Development of the yacht industries through yachting, outdoor recreation, and yacht maintenance integration in 32 government- and privately-owned marinas in Malaysia.

### Key Trends that are Affecting the Industry Development

#### 5 Disruptive Technology

Technology innovation that upends the market and produces novel goods and services, such as 3D printing, advanced materials, robotics, etc.

#### 6 Seaborn Trade Shaped by Consumers' Behavior

The demand for shipbuilding is interrelated to the volume and nature of seaborne trade i.e types of goods being transported affecting the demand for vessel use.

#### 7 Green & Environmental Regulation

In light of growing fuel prices and International Maritime Organisation (IMO) regulations aimed at reducing marine pollution, green and renewable energy sources should be explored.

## Conclusion

The shipbuilding industry in Malaysia faces various challenges, including competition from other countries, fluctuating demand for new vessels, and the need for skilled labor. However, the industry has shown resilience and continues to innovate and adapt to changing market conditions.

Overall, the shipbuilding industry in Malaysia is an important contributor to the country's economy and has significant potential for growth and development as we have excellent supply chain networks and infrastructure here to create a conducive environment for the local SBSR business to expand.

We facilitate and empower members and partners through nurturing, expanding and building high technology capacity of the Malaysian industrial ecosystem by creating opportunities and building competencies.

## MEMBERSHIP



### MEMBERSHIP CATEGORIES

#### LEAD

Selected Malaysian key industry players

#### PERMANENT

Government organisations, research institutes and universities

#### ORDINARY

Malaysian companies owned by Malaysian citizens

#### ASSOCIATE

Non-Malaysian controlled companies

### STRATEGIC BENEFITS



Global exposure to strategic technologies and business.



Providing input to formulate national strategic plans for high technology sectors.



Opportunities for collaboration and partnership in technology and business.



Participation in business forums, consultations and global missions organised by MIGHT.



Participate in collective technology efforts beyond the resources of individual organisations.

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by:



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## Drone Applications: From Military to Commercial Zone

Drones made their first appearance in 1983 in the star-studded cast comedy movie 'Deal of the Century' featuring Chevy Chase, where an aerospace firm was to introduce what was supposed to be a cutting-edge drone fighter but did not live up to expectations.

In the 1993 movie Star Trek: Insurrection, unmanned remote-controlled drones would identify individuals on a planet's surface and transport them onto a starship above. Babylon A.D. of 2008 featured aerial drones which patrolled the Alaskan-Canadian border, attacking the protagonists. If we observe the use of drones in such movies, we can generalise them as being used for attack, surveillance, or carriage. Scenes involving them would almost always be associated with chaos, action-packed scenarios, killing, and surveillance in a dystopian futuristic world. This is not shocking since, prior to their introduction to the civilian market, drones had only ever been used in the military (Alkobi, 2019).

We would probably imagine a drone, an unmanned or unpowered vehicle or craft used by the military, to be small, sturdy, and operate in stealth, given that the word "drone" originally referred to a male bee (Benchoff, 2016). Like the bee, mechanised, radio-controlled drones generate a humming sound when they fly. The DH.82 Queen Bee



*The DH.82 Queen Bee is a testament that a drone can be of bigger sizes as long as it is unmanned. They are not necessarily confined to flying in the air; drones can also move on the ground or below water. Aerial drones are called Unmanned Aerial Vehicles (UAVs).*

pictured above, also called the 'Mother of Drones', became the first returnable and reusable unmanned aerial vehicle in 1935. It was used as a training mission aerial target (PIX4D, 2019).

On 11 December 1903, the Wright brothers successfully achieved their maiden engine-powered and controlled flight, one of the first ever recorded in history. However, attempts to take to the skies have been traced back to the 6th Century. The most well-known expression of this desire to fly would be Da Vinci's ornithopter design that emulated the wings of a bird (Ottin, 2022). We then have the hot air balloon, which made its debut in 1783, thanks to the Montgolfier brothers. Two decades later, we saw the invention of the glider by Sir George Cayley in 1804, and

from this creation, the Wright Brothers successfully innovated a piloted version.

When WW1 broke out in 1914, military-purpose aircraft were already equipped for reconnaissance, bombing and air-to-air combat. Countries seemed to have leveraged the Wright brothers' creation and driven innovation to its height with the aeroplane, with the prospect of a bigger war looming. As the war progressed and up till the war ended in 1918, aeroplanes were modified and equipped with forward-firing machine guns (Keitch & Blair, 2017).

War became the driver of fast-tracked innovation and adaptation of the aircraft to become 'wartime-friendly' in

the quest for superiority (Roos, 2022), so much so that when WW2 started in 1939, aircraft were destined to be war machines, culminating with the world witnessing the dropping of the atomic bombs on Hiroshima and Nagasaki by a B-29 bomber plane towards the tail end of the hostilities. While warfare popularised aeroplanes as harbingers of death, the commercial sector had witnessed its first flight on January 1, 1914, just months before WW1 started via an airboat from St Petersburg to Tampa (IATA). The advancement we see in the commercial aviation industry now is a result of continuous innovations and improvements following that first flight.

In terms of drone technology, its beginnings commenced when the Good Brothers, Walt and Bill, made their first successful remote-controlled (RC) aeroplane called the Big Guff in 1938 (Posea, 2023). The first military drone was seen in World War 2 when the FX-1400, nicknamed The Fritz X, a 2,300-pound guided bomb, was used to sink ships.

Drones have already been democratised and extended to the commercial market since the early 2000s, as in no longer strictly limited to military purposes. They have become affordable enough for hobbyists to modify a simple drone into one equipped to enter the war zone (González, 2023). They complement military-grade ones; for example, they are equipped with thermal-imaging cameras that can detect combatants even in pitch-black conditions and do so in stealth mode (Kunertova, 2023). Apart from drones created locally in Russia and Ukraine, military-grade drones have their origins traced to Turkiye with the Bayraktar TB2, the United States with the Switchblade 600s, Jump 20s, ALTIUS-600s, and CyberLux K8s (Trevithick, 2023), and Iran with the Shahed 131 and 136, and the Mohajer-6 multi-role drone (Beaumont, 2023). China's DJI tops the list for commercial-modified-for-war drones (Myre, 2023), with each drone displaying its technologies and capabilities on the battlefield. Russia has purportedly used exploding ones, and Ukraine has scurried to secure

strike drones to counter Russia (Arhirova, 2022).

In terms of commercial drones, the quadcopter model is one of the more common types of commercial drones. Its early development began in 1907, when the Bréguet brothers, with the help of a French physiologist, developed their gyroplane (Vyas, 2020). The Federal Aviation Administration (FAA) of the United States issued their first commercial drone permits in 2006 (Dormehl, 2018), with DJI being the first drone company to receive such a permit. Jeff Bezos had, in 2013 when he was helping Amazon, announced that the company was introducing octocopters. These delivery drones would 'pick up packages' in small yellow buckets at Amazon's fulfilment centres and whiz through the air to deliver items to individual customers 30 minutes after they hit the 'buy' button online at Amazon.com. (60 Minutes, 2013). Since that announcement, the commercial drone industry has become abuzz with development and innovation. The Boston Consulting Group estimated in 2017 that in Europe and the US, more

The Components of Value in the Drone Business

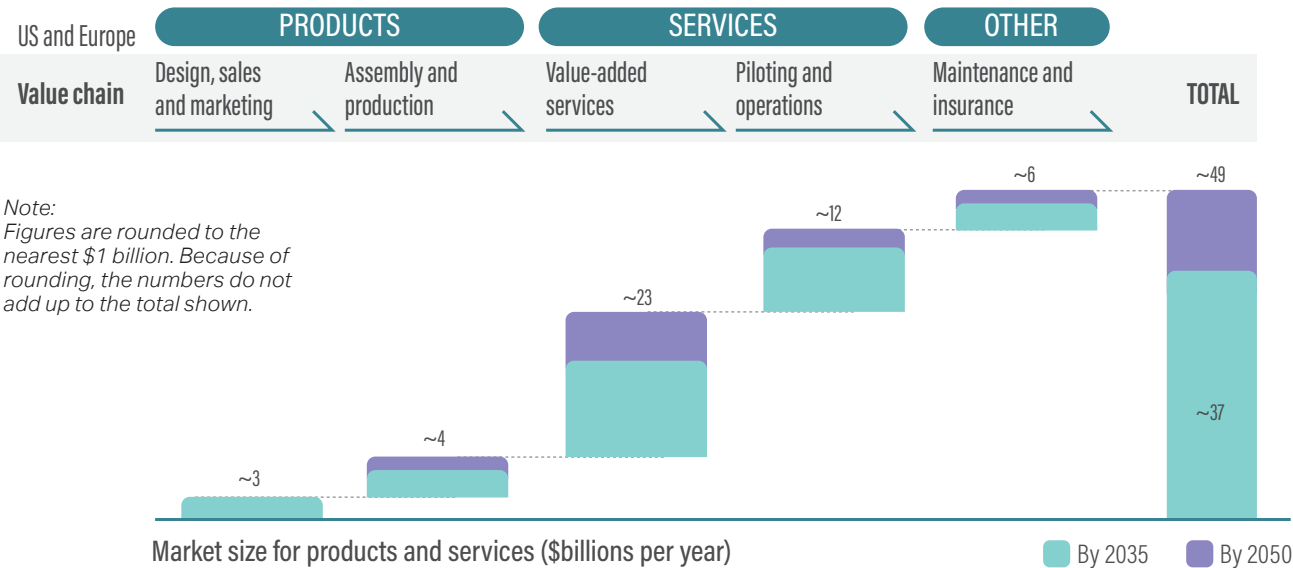


Figure 1: Drone value in products and services

Source: BCG Analysis 2017

than 1 million drones will be in use by 2050 and generate approximately USD50 billion in revenue from the products and services associated with them (Amoukteh, et al., 2017). Six years ago, BCG had forecast that drone adoption would accelerate, especially in value-added services, as shown in Figure 1.

Global research companies predict positive growth for products, services, and other sectors, with Unmanned Airspace envisaging that once commercial drones are allowed to fly beyond line of sight (BVLOS), the opportunities in their applications would be abundant (Unmanned Airspace, 2023). Likewise, Air Asia announced obtaining CAAM's approval in 2022 to conduct remote drone pilot training (RPOT) as they looked forward to revolutionising their e-commerce platform to include a drone delivery (Air Asia, 2020). Malaysia's MDTAP-30, an acronym for Malaysia Drone Tech Action Plan 2030, is currently under development to support and grow the drone ecosystem for the country.

As is, we can see many drone services and applications in photography and filming, inspections, agriculture, mapping and surveying, and the possible applications are still expanding—credit to the hobbyists who started the drone craze in 2013. DJI, a Shenzhen-based drone company—which now has the biggest chunk of the global commercial market share—introduced the first commercial model called DJI Phantom 1 in 2013. In agriculture alone, there are still many verticals within which drones can serve, as different crops or trees require different calibrations on the software and hardware used by UAVs. Once delivery with drones is enabled, the opportunities would be endless. Malaysia has excelled in drones as a service (DaaS); currently, Aerodyne has been ranked number 1 globally as a drone service provider for the second consecutive year by Drone Industry Insights 2022. Another drone company, Meraque, is ranked 18th. Adding to that list of accolades, the country's Drone Readiness ranking has significantly improved by jumping nine notches to number 21 (Chern, 2023).

The services they provide are not limited to traversing the skies but also underwater and on or underground. Underwater-capable drones are called ROVs (remotely operated vehicles), so instead of having to deploy costly mini-submarines and humans to carry out a task, the more affordable and highly manoeuvrable drones are preferred (Ip, 2022).

The underpinning barrier to BVLOS taking flight is the unmanned traffic management (UTM) to support the infrastructure. Different drone operators serve their own 'drone operating space', and we do not see drones crisscrossing one another in the skies above civilians. A UTM would be crucial to manage drone traffic just as we have air traffic management (ATM) to monitor aircraft in our airspace. As highlighted in the Drone Regulation Report 2023 by DII, there are challenges to standardise BVLOS and UTM services (Lotfi & Bödecker, 2023). An additional aspect of safety would be insurance, although it is already recommended for drone operating companies to subscribe

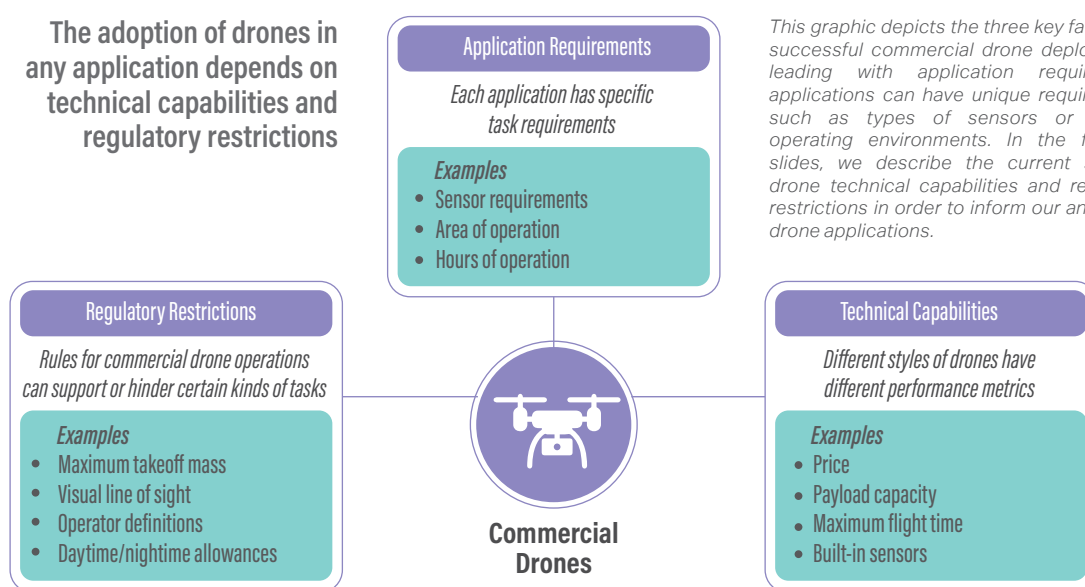


Figure 2: 3 key success factors for successful commercial drone deployment

Source: Lux Research

to it. Not least in the matter of drone application is the concern of ethics. How would we know that the drone flying above us does not aim its camera at us and invade our privacy?

There is no denying that drones are modernising both warfare and commercial or industrial applications. Business Insider says we are only in the 5th generation of drone technology out of seven in 2021. Generation 6 will be 'Commercial suitability, safety and regulatory standards-based design, platform and payload adaptability, automated safety modes, intelligent piloting models and full autonomy, airspace awareness'. Generation 7, the final one, will be considered a big revolution in drone tech that will

provide more advanced innovation for the military, logistics, commercial and transport sectors (Business Insider, 2021). For drones to excel further in commercial applications, there needs to be harmonisation between application, technical and regulatory requirements.

As civilians, we would like to see safety as the topmost priority in all aspects of drone usage. Trust and confidence will develop over time, but initial certification requirements must ensure that all safety aspects are addressed and stress-tested. We can rest assured that drone technology will keep improving. The right infrastructure (regulations, processes, and implementations) needs to be there to

provide a safe environment for drones to fly. So let's anticipate the day when we place an internet order for meals from a restaurant, and a few minutes later our food is delivered to our door by a sturdy-looking quadcopter drone.



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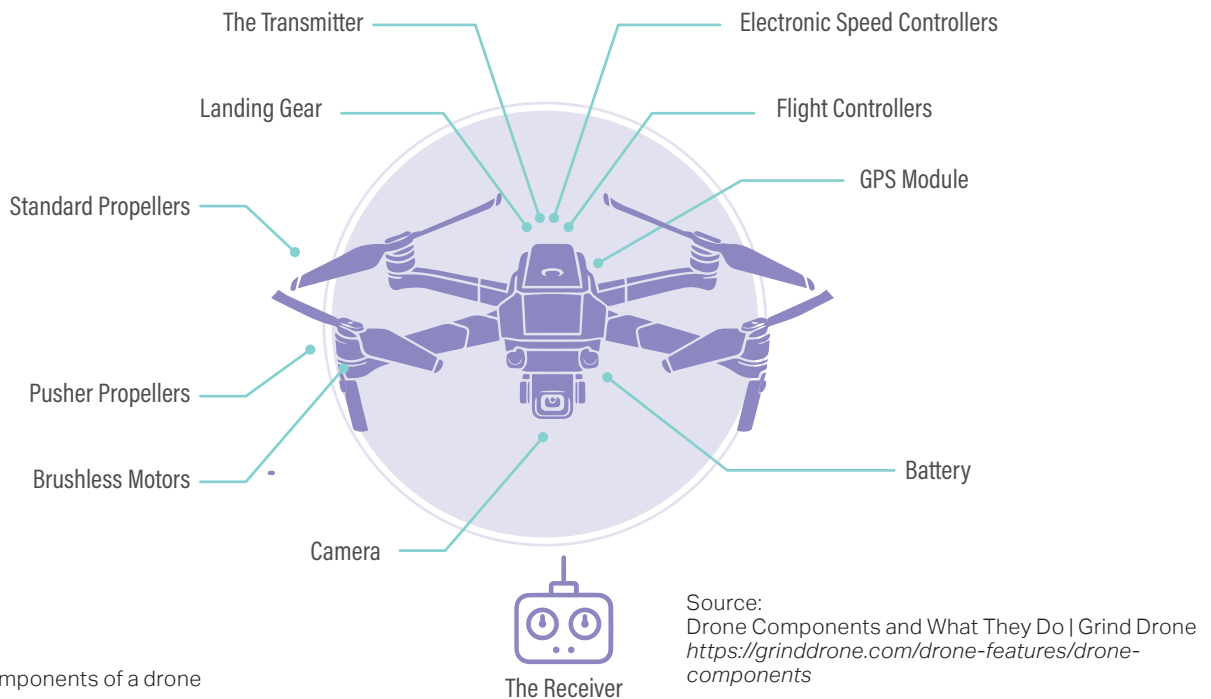


Figure 3: Components of a drone

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by:



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## Next-Generation Technologies for Air Mobility Industry

Advanced Air Mobility also can be referred to as the next generation of air transportation systems.

Today's fast-paced society is made possible by technology. Technology, to an extent, has increased connectivity, accessibility, and affordability in many aspects of our lives. Technological innovation, particularly digitalisation and electrification, is on the cusp of radically changing the concept of the current air mobility industry by enabling new ways of moving goods and people.

Advanced Air Mobility (AAM) is an emerging industry that focuses on developing and operating new types of aircraft designed to provide on-demand, point-to-point air transportation services for passengers and cargo. This emerging industry aims to provide a safe, efficient, and sustainable alternative to

traditional transportation modes, such as ground-based vehicles, particularly in areas with high traffic congestion or limited access to transportation infrastructure.

AAM vehicles such as electric-powered helicopters, flying cars, and vertical take-off and landing (VTOL) aircraft are designed to operate at lower altitudes and speeds than traditional aircraft, making them suitable for short-distance transportation urban mobility applications. PricewaterhouseCoopers reported that the global AAM market is expected to grow at about 20 to 25 percent between 2021 to 2030, reaching an estimated value of about 38 to 55 billion Euros by 2030.

### Technologies shaping the AAM industry

Advanced Air Mobility also can be referred to as the next generation of air transportation systems that are underpinned by a range of technological advances.

The table on the next page shows some of the technologies that are advancing the air mobility industry.

A number of these technologies are still in the early stages of development, but they have the potential to revolutionise air transportation, making it safer, more efficient, and more sustainable. A small number of companies and organisations across the globe are investing in the development of next-generation technologies for the AAM industry, and several demonstration/prototype projects are already underway.

## ENABLER FOR AAM

## TECHNOLOGY

## HOW IT WORKS...

**Vehicle Safety****Virtual & Augmented Reality**

Virtual and Augmented reality technology can be used to enhance situational awareness for pilots and ground crew, allowing them to see a virtual representation of the aircraft and its surroundings.

**Predictive Maintenance**

Predictive maintenance is a technique that uses data analysis and machine learning algorithms to predict equipment failures before they occur. In the aviation industry, predictive maintenance is applied to improve aircraft maintenance and reduce downtime. By analysing data from sensors and other sources, predictive maintenance systems can detect potential problems and alert maintenance crews before a breakdown occurs.

**AI-Enabled Sensors**

Recent advancements in machine learning capabilities enable developers and operators to extract more insights and value from sensors. Advances in artificial intelligence and machine learning are making it possible for aircraft to fly autonomously, without the need for a human pilot. Autonomous aircraft can improve safety, reduce operating costs, and increase efficiency.

**Noise Reduction****Electric Propulsion**

Electric motors are becoming more powerful and efficient, making them a viable option for aircraft propulsion. The use of electric propulsion in aircraft can reduce carbon emissions, noise pollution, and fuel costs.

**Liner Technology**

AAM vehicles are anticipated to produce less noise than traditional aircraft, although there is still a need for further noise reduction. Technologies such as acoustic liners and active noise control can be used to reduce noise levels.

**Electric Aviation****Battery Technology**

Batteries are the heart of AAM aircraft. AAM batteries must provide high power for long periods to enable vertical take-off, be light enough to sustain reasonable flight times and cargo loads, demonstrate good durability to provide long life and meet the highest commercial aviation safety standards. Advancement in Lithium-ion battery technology has enabled sufficient battery density (~250 Wh/kg) to support primarily low-range AAM applications.

**Fuel Cell**

The AAM industry is showing a growing interest in hydrogen fuel cell technology. In these systems, oxygen from the air is fed into stacks of fuel cells to create a reaction that separates electrons from hydrogen molecules, producing water vapor and also current that can turn the wheels of automobiles or the propellers or rotors of an aircraft.

**Electric & Hybrid Aircraft**

Electric and hybrid aircraft are becoming increasingly popular as the aviation industry seeks to reduce its carbon footprint. These aircraft are powered by electric motors, reducing emissions and noise pollution. Major players in the industry, such as Boeing and Airbus, are investing in the development of electric and hybrid aircraft.

**VTOL Aircraft**

VTOL aircraft can take-off and land in a vertical position, making them ideal for AAM and other short-distance transportation needs. VTOL aircraft can also operate in areas with limited infrastructure, such as remote locations that lack long runways.

**Advanced Materials**

Advanced materials, such as composites and ceramics, are being used in aircraft design to improve performance and reduce weight. These materials offer benefits such as increased fuel efficiency, improved durability, and reduced maintenance costs.

**Infrastructure & Eco-System****5G**

Development of operational capabilities to support long-term growth. In order to ensure operations are safe and smooth, 5G coverage is essential for drone network identification and profile management, remote control, drone location tracking, geographic SIM density maps, etc.

**Air Traffic Management****Next-Generation Air Traffic Control**

Next-generation air traffic control (ATC) systems are being developed to improve the efficiency and safety of air travel. These systems use advanced data analysis and communication technologies to manage air traffic more effectively. Next-generation ATC systems are expected to reduce delays, improve safety, and increase capacity of the airspace system.

**Blockchain**

Blockchain enables aircraft privacy and anonymity while providing a secure and efficient method for communication with air traffic services, operations support, or other authorised entities. Also, features certificate authority, smart contract support, and higher-bandwidth communication channels for private communication that may be used for secure communication between any specific aircraft and any authorised member.

## Perils and promises of the AAM industry

AAM industry has the potential to transform the way people and goods move, and it is likely to play a significant role in shaping the future of transportation. With this, a new set of opportunities and risks could possibly emerge.

### FUTURE OPPORTUNITIES

#### Economic:

- **New business model:** AAM technologies could create new business opportunities such as air taxi services, cargo delivery, and emergency medical transport. Also, increasing access to new markets, changing local design and development, and lowering transportation costs.
- **Job creation:** The growth of the AAM industry could create new job opportunities in areas such as engineering, manufacturing, and operations.

#### Environment:

- **Environmentally sustainable:** AAM has the potential to be more sustainable than traditional aviation, with lower emissions and noise levels, which could help reduce the environmental impact of aviation.

#### Social:

- **Enhance mobility:** AAM vehicles can be smaller and more manoeuvrable than traditional aircraft, allowing them to operate in more confined spaces and closer to urban areas. AAM has the potential to provide faster, more efficient, and more flexible transportation solutions, especially in urban areas.
- **Improve accessibility:** AAM services could increase access to remote communities and provide supplies, medicine and emergency services at a lower cost than traditional air services.
- **Increase safety:** The development of autonomous systems and advanced technologies could enhance safety in AAM operations, reducing the risk of accidents.

### FUTURE RISKS

#### Economic:

- **Industry disruption:** The development of AAM could have significant social and economic impacts, such as changes in land use patterns, displacement of existing transportation modes, and potential disruption to existing industries.

#### Policies & regulations:

- **Regulatory challenges:** AAM is a highly regulated industry, and there may be challenges in developing new regulations to support the growth of the industry while ensuring safety and security.

#### Social:

- **Airspace congestion:** The growth of AAM could lead to increased congestion in urban airspace, which could pose challenges for air traffic management.
- **Safety risks:** Although AAM has the potential to enhance safety, there are also risks associated with using autonomous systems and operating aircraft in urban environments.

#### Technology:

- **Cybersecurity risks:** The increasing use of connected and autonomous systems in AAM could create new cybersecurity risks, such as the potential for hacking or system failures.

Looking forward into the future scenario, as the AAM industry evolves, revolves, and matures, the industry will surely face future challenges and matters that industry players and policymakers need to take into consideration for the industry to continue to thrive.

## Operationalising AAM: A Natural Development Progression

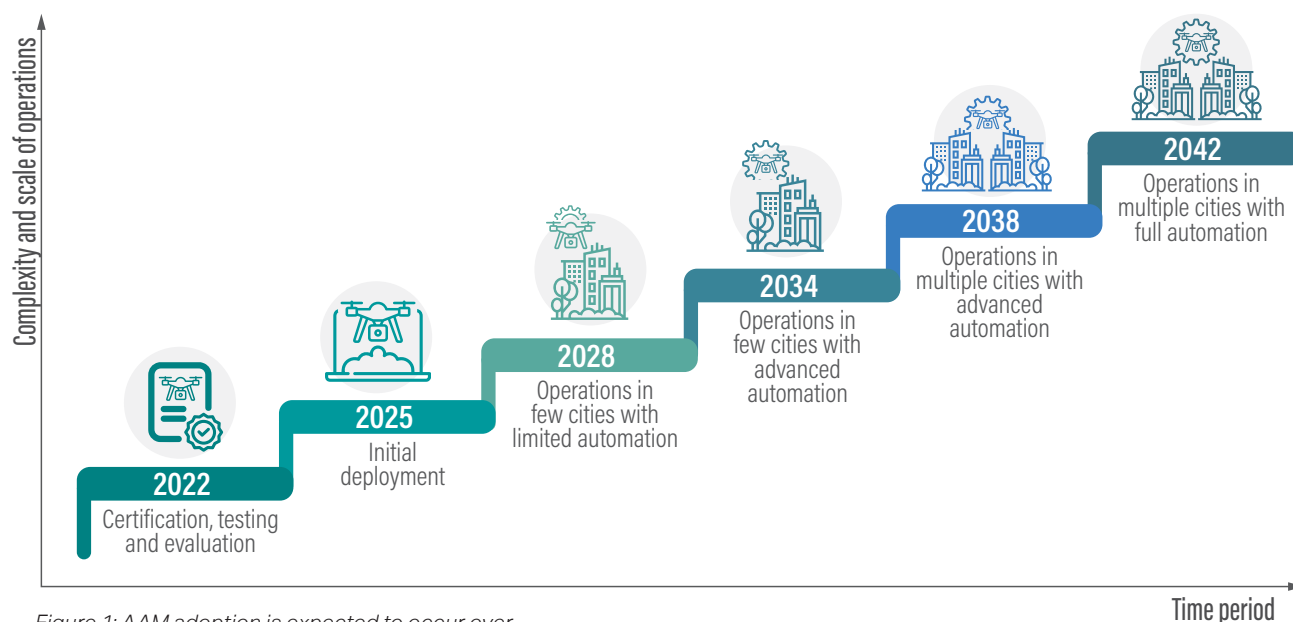


Figure 1: AAM adoption is expected to occur over six phases with corresponding milestones.

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# Challenges & Trends IN SUSTAINABLE MOBILITY



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Sustainable Mobility is a concept for altering transportation from an ecological standpoint with the aim to reduce fuel consumption and emissions, allowing the ecosystem to regenerate.

Sustainability in mobility is not really a choice; it is a necessity...particularly living in a **V.U.C.A.** world where we are constantly faced with challenges.

## The 5 major challenges towards sustainable mobility are:

1. Cybersecurity
2. Dealing with Congestion
3. Electrification
4. Affordability of Public Transit/Transport
5. Rapid Urbanisation

According to UN Environment's electric mobility expert, Rob De Jong, for sustainable mobility to take place, we need three things to happen.

"We need to **avoid** the need for transport, like through better city design where kids can walk to school and shops are close to residential areas;

we need to **shift** to more efficient modes of transport, like public transport and walking and cycling; and

we need to **improve** transport, like through cleaner vehicles."

## CHALLENGE #1 Cybersecurity

To achieve a secure mobility system, there is an urgent need for more scalable and comprehensive security solutions.

Malaysia experienced an average of 84 million cyber attacks every day during the fourth quarter of last year (4Q 2022). - Fortinet (Global Cybersecurity Solutions Provider)

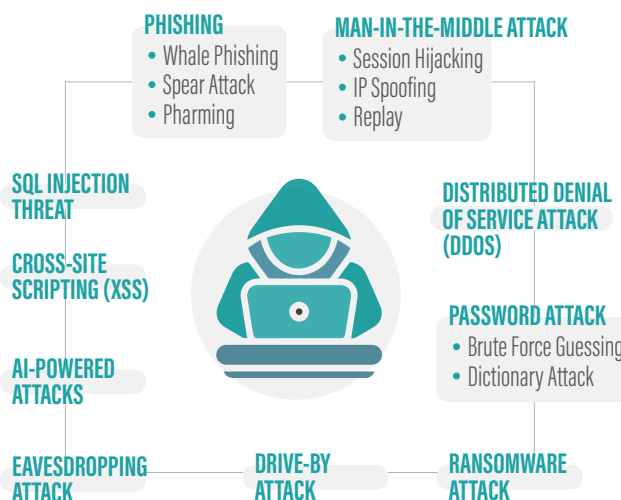
"Cyber attackers are now smarter and more weaponised in their planning by using AI because it is not for fun anymore but for serious business."

"Notable challenges faced by the cybersecurity industry today include the complexity of the digital environment where applications are distributed, users are working from anywhere, more devices are attached to applications, and a shortage of cybersecurity skills."

- Peerapong Jongvibool  
Vice-President, Fortinet Southeast Asia and Hong Kong

Source: NST

## TYPES OF CYBER-ATTACKS



Source: EduSpiral Consultant Services

## CHALLENGE #2

### Dealing with Congestion

Road congestion can indirectly affect employees' physical, emotional and mental health.

Klang Valley workers are estimated to spend at least 44 hours a month in their vehicles due to traffic jams.



*"If the average hourly wage is RM7, multiplied by two hours over 22 working days, the productivity loss is estimated at RM308 a month, which is lost on the road."*

- Dr Ismaniza Ismail

*"Transportation systems in Malaysia form the backbone of social growth and economic expansion. However, the transport sector utilises 40% of the total energy and contributes approximately 30% of greenhouse gasses (GHG)."*

- Puan Normah Osman  
Deputy Secretary General on Policy, Ministry of Transport

## CHALLENGE #3

### Electrification

Electrification entails using electrically powered alternatives to replace or supplement the use of fossil fuel-driven devices, a possible solution for sustainability, efficiency, and smart criteria.

THE ASEAN electric vehicle (EV) market is forecasted to grow to US\$2.7 billion (RM11.77 billion) by 2027, from nearly US\$500 million in 2021, with a compound annual growth rate of almost 33% for the 2022-2027 period.

It was reported last year that the Malaysian government's target to install up to 10,000 public charging stations for electric vehicles (EVs) in the country by 2025 under the Low Carbon Mobility Blueprint 2021-2030 is on track, with around 700 charging stations having been set up nationwide so far, according to the MITI.

Source: MGTC

Natural Resources, Environment and Climate Change (NRECC) is committed to increasing electricity generation from renewable energy (RE) sources through the Electricity Supply Generation Development Plan 2021-2039 while strengthening the grid and developing the EV ecosystem.

Source: The Malaysian Reserve

*Zero-emission urban mobility can help reduce carbon emissions, improve mobility, and free up public space...*



**Tengku Zafrul**

@tzafrul\_aziz

Follow

The entry of @Tesla has been facilitated by MITI through the introduction of the BEV Global Leaders initiative which aims to help boost BEV demand in the local market.

Tesla is the first applicant of this initiative by MITI.

10:45 AM - Mar 1, 2023

## CHALLENGE #4 Affordability of Public Transit/Transport

First mile-last mile connectivity refers to the mode of transport or connection to reach the closest metro-rail station. To make full use of the LRT, MRT and KTM networks, the trip to the nearest or most practical metro-rail station needs to be affordable and relatively short.

For a significant number of people, commuting daily to work is an inescapable fact of life. **Commuting or transportation costs for Klang Valley are estimated to take up 20% to 30% of total monthly expenses**, according to EPF's reference budget (belanjawanku, 2019).



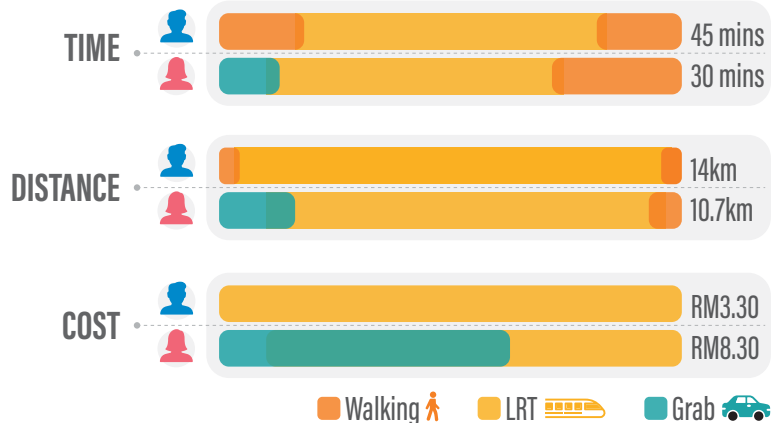
CH,34

CH lives in Taman OUG and commutes to work in Pudu



A,24

A lives in Wangsa Maju and commutes to work in Jalan Tun Razak



CH used to stay in Serdang, and commuted by car for 1.5 hours. This is due to a lack of feeder bus service in his old neighborhood. He has since bought a property closer to an LRT station. For this convenience, however, CH now pays RM1,400 monthly in property loans repayments.

A takes a 5-minute Grab ride every day to the closest LRT station due to the lack of feeder bus coverage in her area. For this convenience, however, A spends RM200 monthly on Grab alone.

Source: The Centre

## CHALLENGE #5 Rapid Urbanisation

Kuala Lumpur and Putrajaya recorded 100 percent of the population living in urban areas, followed by Selangor (95.8 percent), Pulau Pinang (92.5 percent) and Melaka (90.9 percent).

Source: The Malay Mail

*"Building resilient cities—communities that can absorb, recuperate, and prepare for climate-related shocks while also promoting sustainable development—is critical to achieving a climate-resilient Malaysia."*

*"Climate change affects Malaysian cities, and sustainable urbanisation policies that incorporate a whole-of-society perspective might improve the cities' resilience."*

- Kieran Li Nair, a researcher at Research for Social Advancement (REFSA)

Source: NST

The urbanisation rate in Malaysia has tripled from 28.4 percent in 1970 to 75.1 percent in 2020, which was contributed by natural population increase, migration and demarcation.

YEAR	POLICY	SUMMARY
2022	National Low Carbon Aspiration 2040 Plan	To assist with achieving net zero greenhouse gas emissions (GHG) in 2050, addressing energy transition and climate change among others.
	Budget 2023	Year-end launch of VCM, flood mitigation plan until 2030.
2021	12 <sup>th</sup> Malaysia Plan	A broad 5-year plan with a chapter calling for the advancement of sustainable and resilient green growth, with targets such as net zero emissions by 2050, 120 towns to reach sustainable urban status by 2050, etc.
	Budget 2022	Announcement of voluntary carbon market (VCM). Low carbon transition facility.
	National Low Carbon Cities Masterplan (NLCCM)	A guide for policymakers at all levels of government – federal, state and local authorities for the implementation of low carbon cities.
	Low Carbon Mobility Footprint 2021-2030	Policy framework to mainstream the shift towards electrification in the transportation industry as a key strategy to reduce GHG emissions.

Source: REFSA Brief Issue 14

# 6 Sustainable Mobility Trends

Sustainable mobility trends refer to current and emerging practices, technologies, and concepts aimed at creating transportation systems that are environmentally friendly, socially equitable, and economically viable. This following section outlines the **6 mobility trends and their implications for sustainability**:

1. Repurposing of Business Models
2. Data Empowerment
3. Green Tech Design
4. An Urban Reset
5. Well-Being on the Move
6. Neo-Politics

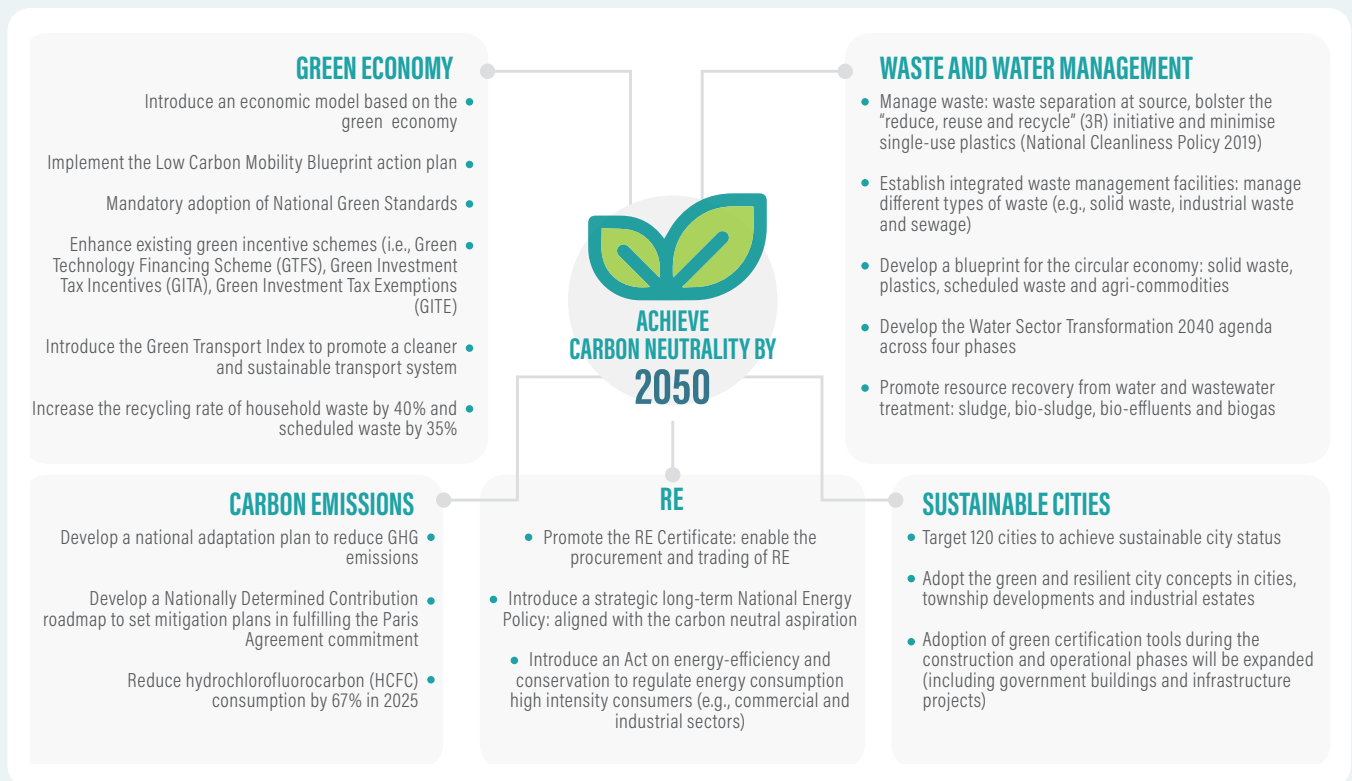
## TREND #1 Repurposing of Business Models

To move the economy towards purpose-driven and value-focused business models in the mobility sector, repurposing of business models is crucial. It propels the sale of mobility to clients in a way that is economically sustainable.

The 12<sup>th</sup> Malaysia Plan's Five-year Sustainability Plan for Malaysia serves as a roadmap for businesses to repurpose their business models.

There must be a mindset shift to move corporate Malaysia to be self-regulated with better internalisation of sustainability and ESG principles

- Datuk Haji Hasbi Bin Habibollah,  
Deputy Minister, MOT



## TREND #2 Data Empowerment

Data empowerment is the connection of the digital and analogue worlds through data-based and technical solutions for mobility. It is fueled by the use of data by organisations in the public and private sectors.

### Malaysia Intelligent Road & Traffic System Initiatives

#### Intelligent Transportation System Technology – Traffic Management Centres

Upgrading the country's current transportation system, with **big data analytics** forming the core of the system

#### Smart Traffic Management – Cyberjaya

Deploying IoT networks, **digital analytics** cameras and establishing a traffic management command centre

#### The Intelligent Transport System Blueprint, 2017-2022

Addressing mobility problems by looking towards **big data analytics** as an intelligent information-gathering tool

#### Smart Integrated Mobility Management System (SIMMS) - Iskandar Malaysia

Minimising congestion and pollution by integrating and **utilising data** for sustainable urban and transport planning

#### Malaysia City Brain Project

Integrating technological measures, 5G, IoT and AI in the future traffic network, parking and better-managing energy via digitalisation and high technology adoption

#### Grab Data Sharing

Sharing Grab's GPS data streams to users on real-time anonymised traffic data for popular Kuala Lumpur routes

## TREND #3 Green Tech Design

The world needs a technical race amongst businesses to develop the most emission- and energy-free transportation solutions. With this, the effectiveness of the solutions must be evaluated over their whole life cycle based on their energy balance.

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## TREND #4 An Urban Reset

'Urban resetting' points to significant changes that are happening in urbanisation towards creating more sustainable urban areas. This is affecting not just mobility, but also the way people live, build, and shape spaces.

Cyberjaya is an example of an 'urban reset', where it will be the capital of smart and intelligent systems of mobility. The city is targeting 80% coverage of an integrated green mobility network by 2025.

The mobility initiatives are as follows:



Ridesharing



Drone testing zone



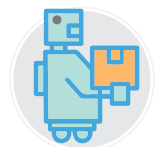
Charging station infrastructure



Autonomous Vehicles Test Route



Pilot test for Autonomous Vehicles, on-demand shuttles



Auto-delivery robots

## TREND #5 Well-being on the Move

"Well-being on the move" refers to an individual's value-based lifestyle choice that motivates them to move around and establish their personal health. It also includes the political landscape for more sustainable mobility as well as digital and analogue enablers.

BEAM Mobility, a micro-mobility operator, reported over one million e-scooter trips recorded in Malaysia in the year 2022, with 10% of them being to or from public transit facilities.

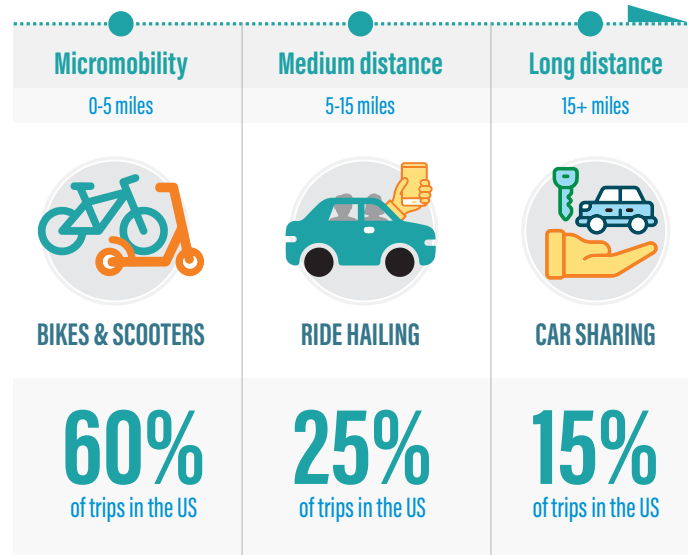
A clear indication of public acceptance of the first and last-mile transport service and a signal that people would leave their cars behind if better on-demand options are available.

Beam showcased strong growth momentum in 2022, registering a vast number of new sign-ups which brought its total pool of riders to 65% higher than in 2021. Today, the total number of registered users in Beam's database sits at well over 800,000 people.

Source: The Sun Daily

### DISRUPTING THE CAR

Alternatives to car ownership by trip length



Source: NHTS

## TREND #6 Neo-Politics

Social media technology has made it easier for new social and political movements to arise outside of conventional systems. This gives climate-friendly actions more legitimacy in the eyes of policymakers and deters the development of climate-damaging transportation options.

### Malaysian environmental NGOs to aid in reducing carbon footprint

#### Focus on

**Zero Waste Malaysia**



Advocate for sustainable development while increasing the local community's awareness of sustainable living.

**Centre for Environment, Technology and Development, Malaysia (CETDEM)**



Climate change



Sustainable Energy



SUDI Sustainability Studies



Organic Farming



Sustainable Transport

**Sahabat Alam Malaysia**



Agriculture



Climate change



Development & Planning



Forest & Biodiversity



Marine & Fisheries



Pollution & Extractives

**Transit Malaysia**



Transit Malaysia's aim is to fight for better public transportation and urban planning in the Klang Valley, and in Malaysia as a whole.

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#### KUALA LUMPUR (Oct 25):

Tired of the poor quality of public transportation, several NGOs and a political party have decided to team up to raise awareness on the matter and offer suggestions for consideration by the authorities...

By [The Edge](#)

Oct 25, 2012

[NGOs team-up for public transport betterment](#)

# Sustainable & Innovative Mobility Technology

by:



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The sustainable mobility sector has progressed significantly in response to various challenges and trends. This leads to the need for innovation in sustainability mobility. Innovation plays a crucial role in advancing today's sustainable mobility, some of which are portrayed in this article.

## Advanced Mobility Technologies

### Mobility Solutions as a Service (MaaS)



- MaaS Facilitates the use of multimode transport and shared mobility services and enables payments via a single interface.
- On February 21, 2020, Malaysia launched the National Automotive Policy 2020 (NAP 2020) adding three new key objectives: Next Generation Vehicles (NxGV), Mobility as a Service (Maas), and Industrial Revolution (IR 4.0).
- NAP 2020 aims to expand the domestic industry in the sector of MaaS, particularly for the development of an integrated transport ecosystem.

### Micro Mobility System



- A more attractive alternative mode of transportation to reduce per capita emissions and improve traffic flow.
- Among the most frequented solutions today are bicycles, e-bikes, small electric cars and electric scooters.
- The Malaysia Electric Micro mobility Industry Association (MEMI) estimates that 200 certified micro-mobility vehicle sellers are in Malaysia, with 14,000 to 15,000 devices sold annually as of 2021.

### Public Autonomous Transport



- Deploying a network of sensors, cameras, radar and LiDAR to ensure better road safety and improve commute times.
- Linking public transport to intelligent traffic control and management systems.
- According to a report by the Malaysian Automotive, Robotics, and IoT Institute (MARII) the Malaysian government is actively encouraging the development and adoption of autonomous vehicles to address the challenges of traffic congestion, safety and pollution.

### Artificial Intelligence in Traffic Management Solution



- Designed to help transport authorities meet strategic goals by minimising vehicle emission levels and reducing traffic congestion in residential areas.
- In Malaysia, TM ONE, a business solution arm of Telekom Malaysia Berhad has developed a system that programmes traffic lights to respond to real-time data collected via cameras and sensors.
- In Ipoh a smart traffic light system powered by AI and 5G has improved traffic flow by 51% during peak hours

### Smart Travel Assistant



- Focuses on the 'complete trip' by advising on the best time and method of transport to get to a destination, with real-time updates on traffic congestion and other unexpected delays.
- Prasarana has launched the journey planner app; Pulse, which stands for Planning Your Lifestyle Efficiently. The Pulse app provides info on the status of each service and the estimated time of arrival (ETA), based on the real-time location of buses and trains.

### Smart Parking



- Provides parking managers with accurate data on parking space usage and also supports adaptive street light management, intelligent traffic management and retail services for easy navigation.
- TM ONE has developed a smart parking solution to give drivers and authorities real-time information and show drivers where spaces are via a smartphone app. It also provides parking authorities with a single platform through which they can monitor all the spaces under their purview.

### V2I, V2X, V2V



- Technologies with which vehicles (cars, trucks, etc.) exchange information in real-time. Vehicles send out standardised information such as speed, GPS, and location. The traffic infrastructure also sends out data on traffic jam warnings, accident warnings, information on alternative routes, detours and much more to enhance efficiency.

### Mobility Hub/ Mega Hub



- A Mobility Hub is a publicly accessible hub where shared means of transport are available at any time. It starts small—e.g. with a bus stop where shared bikes and e-scooters are available—and can be scaled up as needed.
- Large mobility hubs or mega hubs are usually located at transport hubs where many people come together, e.g. at railway stations. When a (long-distance) bus or train arrives, car-sharing vehicles, (cargo) bicycles, e-scooters, taxis, etc. are ready for the onward journey. Additionally, lockers, charging stations for electric vehicles and much more can be found there.

## Advanced Land mobility in Malaysia

### High-speed rail



- The idea of the Kuala Lumpur-Singapore High Speed Rail was initiated through the Economic Transformation Programme to transform Malaysia into a high-income nation. The KL-SG HSR is an alternative travel mode between two of Southeast Asia's most vibrant and fast-growing economic engines. The project was temporarily suspended in 2018, but there are ongoing discussions about its potential benefits and costs.

### Autonomous vehicles



- MyAV reveals official autonomous vehicle routes in Malaysia—2 loops near Futurise, MaGIC in Cyberjaya. Malaysia's first autonomous vehicle test routes on public roads was first defined in November 2020, located in Cyberjaya. Beyond Cyberjaya, other MyAV test routes are being formed in Putrajaya as well as in Putri Iskandar, Johor.

### Electric vehicles



- To reduce carbon emissions and improve air quality, Malaysia is promoting the adoption of electric vehicles (EVs). The government has implemented various incentives and policies to encourage the use of EVs, such as tax exemptions and reduced road tax for EV owners.

## Advanced Air Mobility (AAM) in Malaysia

### Urban Air Mobility (UAM)



- Collaboration between government agencies, industry players, and academic institutions is critical for the development and adoption of UAM in Malaysia. This includes partnerships between Civil Aviation Authority of Malaysia (CAAM), industry players such as AirAsia and academic institutions such as Universiti Teknologi Malaysia.
- Examples of UAM include Electric Vertical Take-Off & Landing (eVTOL), and Electric Conventional Take-Off & Landing (eCTOL)

### Cargo drones



- DHL has collaborated with various partners in Malaysia to develop and deploy its cargo drone technology. This includes partnerships with Matternet, the Malaysian Red Crescent Society, and the Ministry of Health.
- DHL's use of cargo drones in Malaysia has shown promise, particularly in the delivery of medical supplies to remote and hard-to-reach areas

## Advanced Maritime Mobility (AMM) in Malaysia

### Autonomous surface vessels (ASVs)



- Malaysian geo-solutions provider HGIS has used their first uncrewed surface vehicle (USV), the 5.5 m M40P developed by OceanAlpha, to complete an entirely remote nearshore inspection of a subsea pipeline in TALI Field for their project with Brunei Shell Petroleum (BSP).

### LNG-Powered Ships



- Petronas operates the world's first Floating Liquefied Natural Gas (FLNG) facility, the PFLNG Satu. The PFLNG Satu is a LNG powered ship that produces, liquefies, and stores natural gas offshore.
- The facility is designed to produce 1.2 million tonnes of LNG per year and is located in the Kanowit gas field, offshore Sarawak in Malaysia.

### Autonomous underwater vehicles (AUVs)



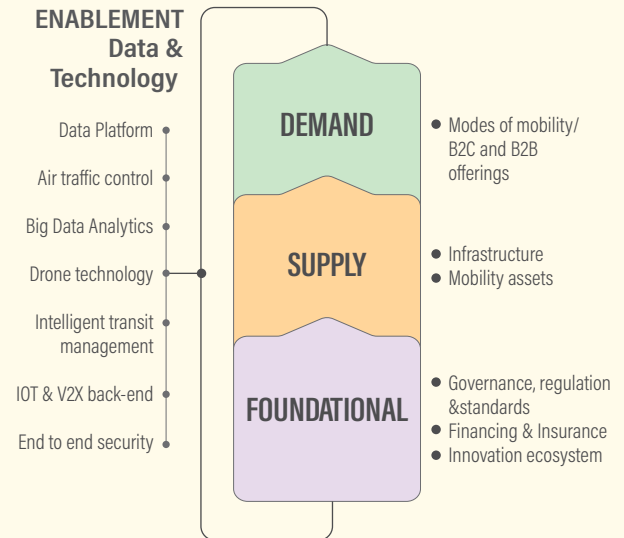
- Underwater drones were used in the search for MH370, including the Bluefin-21 autonomous underwater vehicle, which was deployed to search the seabed for the wreckage of the aircraft.
- The Bluefin-21 was used to map the seabed and search for debris using sonar technology. The use of underwater drones in the search for MH370 demonstrated the potential of this technology in oceanographic research and exploration, as well as in search and rescue operations.

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# Embracing A Sustainable MOBILITY ECOSYSTEM

The interconnected nature of the building blocks of mobility,—demand, supply, and foundational—is critical in creating a sustainable mobility ecosystem. By understanding the interconnected nature of these building blocks, a sustainable mobility ecosystem can be fostered, leading to reduced emissions, improved air quality, enhanced accessibility, and a more sustainable future.



## DEMAND

The demand for this ecosystem enhances the **Modes of mobility/B2C and B2B offerings** towards Smart and sustainable mobility.



### Traditional modes

Public bus, Rental car, taxis, Marine mobility, MRT/LRT



MaaS



Micro-mobility



Goods mobility



Air mobility



Advanced ticketing



Smart parking

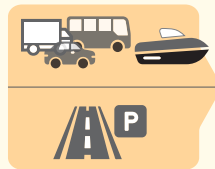


Routing

### Smart ad sustainable modes

## SUPPLY

The supply side of mobility refers to the availability and accessibility of sustainable and smart **mobility modes and supporting infrastructure**.



### Traditional modes

Roads, lanes, railways tracks Waterways, Parking infrastructure



EV, AVs



Flying taxis



Delivery drones, robots



Hyperloop



Smart energy



Aviation Assets



5G IoT sensors



EV charging



Intermodal mobility hubs

### Traditional assets

Cars, vans, buses, trucks Boats, ferries

### Smart/new assets

## FOUNDATIONAL

Foundational elements encompass the underlying infrastructure, policies, and technologies that support a sustainable mobility ecosystem. Improving these elements makes a smart and sustainable mobility ecosystem possible.

### Governance, regulation & standards



- ESG policy
- Aviation, transit authority
- Overall transit strategy

- Urban planning
- Mobility assets policy
- Training Certification

- Cybersecurity policy
- Standards-setting bodies

### Financing & insurance



- Government sponsorship
- Usage-based charge
- Tolls and fines

- Public-private partnership
- Private sponsorship

- Monetising mobility data

### Innovation ecosystem



- Research institute

- Corporates
- Centres of excellence
- Startups

### Smart/new infrastructure

# 7 WAYS TO PROMOTE SUSTAINABLE MOBILITY

Embracing a sustainable mobility ecosystem is crucial for addressing environmental challenges and creating a more sustainable future. All the interactions and interdependencies of mobility must be understood and managed.

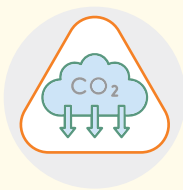
## #1 Reduction of traffic (Road Diet)



Sustainable mobility aims to reduce the volume of traffic by **linking to a strong expansion of environmentally friendly means of transport** (e.g. public transport).

Automatic systems or infrastructure networking can reduce waiting times at traffic lights by up to 40% and increase traffic flow by up to 60%, which has been proven to reduce congestion and reduce accidents by up to 80%. This not only saves money but is also good for the environment.

## #2 Promoting environmentally friendly means of transport



A ban on cars in the city centre is unrealistic, it will be important to **promote alternative, low-CO<sub>2</sub> fuels** (even) more in the future - whether **electromobility or hydrogen-powered vehicles**.

There is a need for:

- more lanes and parking spaces for public transport and sharing services.
- to gradually replace classic combustion engines with alternative drives and CO<sub>2</sub>-neutral fuels.
- more affordable alternatives to cars for residents of the city.

## #3 Promoting micro-mobility and cycling



To switch public preference from private cars to public transport, mitigating the last mile issue is crucial to motivate people in the long term to use their cars less or not at all.

- **More small vehicles** to get from the front door to public transit (last mile).
- **More e-bikes**, e-scooters, and small electric cars (for max. 2 people).
- **More and better bike lanes.**

Alternative means of transportation such as e-bikes, e-scooters and alternative drives, ensure cities become quieter and improve air quality.

## #4 More car sharing, rental offers, and flat rate model



Car-sharing eliminates the need to park in city centres, where parking space is scarce and the search for a parking space can cost a lot of nerves.

- If city dwellers can effectively use car-sharing services at any time—**flexibly and at the lowest possible prices**—it will be much easier to leave the car behind.
- **Pricing structure, range of services, and quick and easy booking (e.g. via app)** will be the most important factors in making car sharing as attractive as possible.

It has been identified that one shared-car can replace between 8 and 20 passenger cars.

## #5

## Promoting autonomous driving



Autonomous vehicles will shape the future of urban mobility, but the technology will still need time to assert itself.

- The total number of vehicles would be reduced enormously: "Use instead of own".
- Autonomous vehicles can park outside the city.
- Autonomous vehicles offer "more safety": human error is responsible for over 90% of all car accidents.

Autonomous cars allow flexibility to park somewhere on the outskirts of town or wherever there is space. A future vision that will make the passenger car more dispensable.

## #6

## Expansion of electromobility and alternative drive



The way transport systems operate needs to be changed to ensure better air quality, lower noise levels and fewer emissions.

- One of the most promising solutions to this challenge is the expansion of **electromobility and alternative fuels** because only low-CO<sub>2</sub> fuels will make it possible to comply with CO<sub>2</sub> emission limits and other climate targets.

Sustainable mobility concepts must focus on electromobility, hydrogen, solar technology or hybrid drives and countries with different (geographical) conditions will ultimately promote and develop different technologies for providing innovative solutions towards sustainable mobility.

## #7

## Shifting logistics to the railway

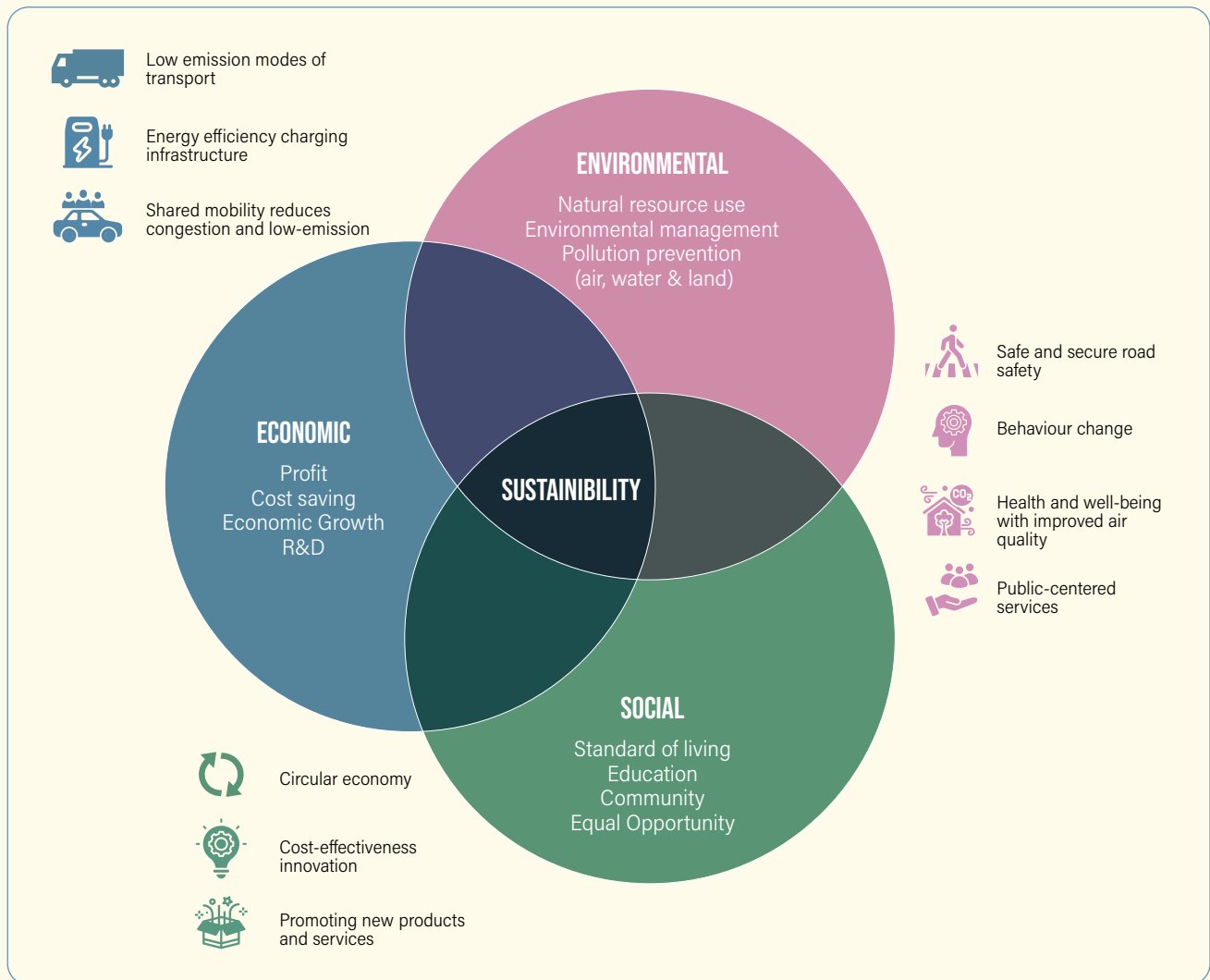


Certain changes must also be made in logistics. A strong promotion of rail transport would be a first step that would have big advantages:

- The majority of trains run on electricity (often even with green electricity).
- Fewer trucks also mean less CO<sub>2</sub> in the air.
- If more trains instead of trucks roll through the country, there will also be more space on the roads.

The use of intelligent fleet management systems improves the eco-balance in logistics. These digital systems make it easier for truck drivers to find freight, reduce empty runs and detours, and thus ensure more efficient logistics.

In conclusion, by putting sustainability at the centre of the mobility ecosystem, the impact will open more innovative opportunities for the future...



# TRAINING ON SCENARIO PLANNING



## LEARNING OUTCOME

### At this training you will:

- ✓ **Experience** a hands-on step-by step process of foresight.
- ✓ **Explore** the tools to develop, assess and test future scenarios.
- ✓ **Learn** how to translate the scenarios into strategies.

**ACT NOW! ONLY 25 PAX  
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**\*\*2 DAYS SESSION**

**\*\*TRAINING MODULE AND  
TRENDS DECK INCLUDED**





### Discussion on the Malaysia Madani Framework and Youth Development

Benevolent Malaysia, Selangor

9 Feb 2023

A meeting was held on November 10, 2022, to discuss a thorough action plan for youth with Pn. Musyifah Bt. Elias and En. Muthu from Malaysia's Ministry of Youth and Sports. The conversation was centered on creating an action plan involving greater involvement from all ministries. The action plan will refer to the discussion on youth development action plans for the new Malaysian youth model. The action plan will support the new model and to be aligned with the Dasar Belia Malaysia. The discussion also specifies the project's finance plan and timetable. A proposal was submitted to KBS for further collaboration work.



### Discussion on Trends Impacting the Future of Work and Potential Responses

MIGHT, Cyberjaya

6 Apr 2023

The future of work is being shaped by various trends that are transforming the workplace and the nature of employment. These trends and potential solutions emphasise the necessity for businesses to be flexible, quick to change, and committed to the growth and welfare of their workforce. MIGHT continues to complement our lead member PETRONAS as discussions were held with PETRONAS Corporate Strategic Planning on trends impacting the Future of Work and potential responses. A discussion was held on April 6, 2023, on matters pertaining to this issue.



### Workshop: The Viability of Black Soldier Fly Larvae (BSFL) as an Alternative Source of Protein

MIGHT, Cyberjaya

16 Feb 2023

MIGHT facilitated a preliminary assessment workshop on the viability of Black Soldier Fly Larvae (BSFL) as an alternative source of protein for animal feed and other potential usages on February 16, 2023. This workshop was organised by MOSTI Bahagian Pemindahan Teknologi dan Perkomersialan R&D. Participants of this workshop were representatives from MOSTI, MAFS, BSFL industry players, research institutions and universities. The workshop facilitation was led by Dr Azuraen Jaafar. Through the workshop, an initial understanding of the local ecosystem (upstream, midstream, and downstream) was identified based on the F.I.R.S.T® Matrix. The output from this workshop will guide MOSTI to identify the next step to develop the industry.

### MIGHT Mission to Moscow

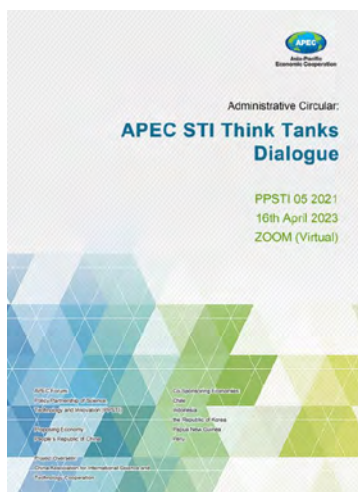
Moscow, Russia

11-12 Apr 2023

A MIGHT Mission to Moscow was conducted for two days in April 2023. The mission was represented by Rushdi Abdul Rahim and Nurul Azammi Mohd Nudri with the following agenda.

► **11 April 2023** – A dinner meeting with Mr. Dmitri, Head of Marketing, Civil Aviation Division, Irkut Corporation. Irkut Corporation is a Russian aircraft manufacturer that produces commercial and small size aircraft. From the perspective of an aircraft manufacturer, the sanction imposed on Russia has caused challenges to the company in terms of supply chain disruption. Despite this, the bright side of the event led to domestic airlines deciding against buying foreign aircraft in favour of domestic aircraft, which increased demand. Nevertheless, the company is unable to cope with the delivery of the aircraft due to supply chain challenges. As a result, a number of initiatives are ongoing to repair the gap in the supply chain, such as the building of an engine supply company. However, more efforts are needed to solve the shortage of supply in interior cabin furnishing and avionics.

## Dialogue: Strengthening of the APEC STI Think Tanks



Zoom engagement

16 Apr 2023

MIGHT, represented by Dr Tan Shu Ying was given the stage as a keynote speaker at the APEC STI Think Tanks Dialogue organised by the International Technology Transfer Network (ITTN) and Center for International and Regional Cooperation, Beijing Academy of Science and Technology. The dialogue, participated by 9 APEC member countries, consisted of policymakers from government departments and official entities related to science, technology and innovation (STI), public and private think tank executives, as well as experts and researchers in the area of STI.

With the objective of strengthening APEC think tank cooperation on STI strategy, MIGHT shared our 30-year experience in developing strategic value in Malaysia's policy ecosystem as a partnership organisation, intermediary between industry-government and a prominent foresight centre infusing foresight into policy making while developing tools such as the F.I.R.S.T® Matrix. Participants were particularly interested in MIGHT's 3C approach to strategic partnership through conversation, collaboration and co-creation, which would be highly applicable in the development of the Beijing Blueprint on Science, Technology, and Innovation Think Tanks Cooperation to Strengthen an Interconnected, Innovative, and Inclusive Future in APEC region.



► **12 April 2023** – A conversation with Dr Alexander Sokolov and Dr Ozcan Saritas, foresight experts from HSE University, was held. The purpose of the conversation was to explore potential areas of collaboration between the university and MIGHT. Dr Alexander, who is also the Chairholder, UNESCO Chair on Future Studies emphasised that their strength is in methodology and statistical areas. He further shared their experiences and past initiatives based on 4 focus areas: 1) Survey on trends and issues for Science, Technology and Innovation (STI), 2) STI for policy, 3) Digital economy through collaboration with the Ministry of Digital, and 4) Foresight related activities such as Delphi studies, scenarios, roadmaps for the government and companies. Apart from the above, the university also provides a capacity building programme through short-term courses and master programmes. With regards to collaboration, Dr Alexander proposed an MoU to be signed between MIGHT and HSE Uni to embark on a joint project (co-creation) and capacity building.





## Potential Collaboration Visit between UNDP-MIGHT

MIGHT, Cyberjaya

18 Apr 2023

What could be the impact of a 1.5°C increase in temperature coupled with an ageing Malaysia in 2040? To better understand the potential impact of the confluence of these drivers on Malaysia's economy and society and if Malaysia's governance structure is ready to brace for these impacts, UNDP Malaysia approached MIGHT to discuss a potential collaboration in developing a publication to help Malaysia attain future ready governance. UNDP was represented by Mr Niloy Banerjee, UNDP Resident Representative for Malaysia, Singapore and Brunei Darussalam and Mr David Tan, Head of Experimentation.



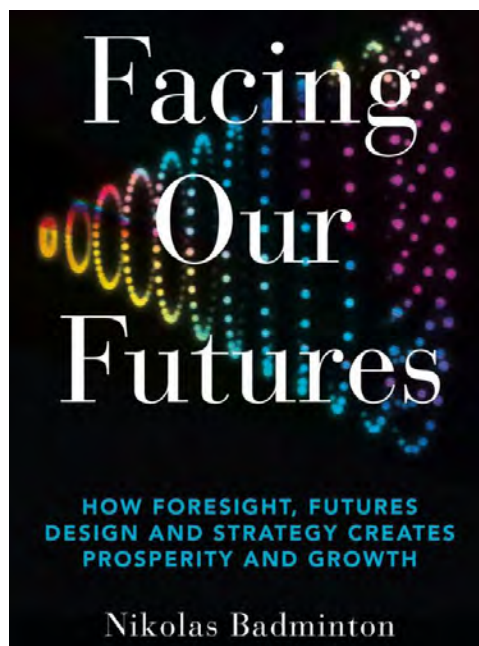
## Scenario Planning Training Workshop Series Q1 2023

Public Service Department  
Duopharma Biotech

6 Mar 2023

17 Mar 2023

MIGHT hosted two workshops for its Scenario Planning Training Series in the first quarter of 2023 for the Public Service Department and Duopharma Biotech on March 6 and March 17, respectively. This two-day hands-on training is meant to increase the organisations' expertise in foresight and scenario planning, as well as make them more resilient and receptive to future opportunities.



## The Future Home in the 5G Era

ISBN-10 : 1399400231

ISBN-13 : 978-1399400237

Author : Nikolas Badminton

Publisher : Bloomsbury Business (February 14, 2023)

The book *Facing Our Futures* provides an intriguing look at how businesses and professionals can establish their foresight and strategy in order to be ready for an uncertain future. Nikolas Badminton draws on his years of expertise as a consultant and futurist in *Facing Our Futures* to give readers the knowledge and perspective they need to equip their team, organisation, and themselves for whatever challenges the future may bring. A broader perspective and a stronger understanding of how their respective industry, society, or community is evolving and changing are necessary for CEOs, executive teams, government officials, and policymakers. After developing this foresight, they must learn how to properly utilise it by foreseeing the future, reinforcing their foundations, and developing a robust and flexible strategy. *Facing Our Futures* serves as an introduction to the importance of understanding how awful things may get and how crucial it is to imagine these futures. Additionally, the book explains on the Positive Dystopia Canvas (PDC), a tried-and-true methodology for strategic planning and foresight. It enables leaders to supercharge their teams to create evocative future visions that enhance planning today.



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- System Upgrade
- System Procurement and Management
- Radar and ATM System Performance Analysis

### 02 Comprehensive Maintenance

- Hardware and Software Maintenance
- In-Country Repair (Workshop)
- System Overhaul
- Industry Maintenance (OEM)

### 03 Consultancy, Facilitation and Procurement Services

- Airport Control Tower Design and its associated equipments
- CNS / ATM ASBU Compliance

### 04 System Procurement and Supply

- Air Traffic Management Systems
- NAVAIDS (DVOR, DME, ILS and (TACAN)
- Uninterruptible Power Supply Systems (UPS)
- Radio Communication equipment
- COTS

### 05 Training (Human Capital)

- ATC System Operators Training
- Radar System Training
- Communications System Training
- NAVAIDS Systems Training
- Ancillary Equipment Training
- LEONARDO System Integration

### 06 Industrial Collaboration Program (ICP)

- ANSP
- Regulator
- MAVIA
- Industry (OEM, University)



# Map The Future

As a stakeholder and strategic policymaker, you can contribute by voicing out your opinion to help us map out the desired future for Malaysia

This is an invitation by **myForesight®** to every member of the public. If you think we could have done better or

perhaps you would like us to cover a specific topic in the study of Foresight or better yet, you would like to contribute an article, we would love to hear from you.

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We look forward to hearing from you.

**myForesight®** team

