NATIONAL RESILIENCE COLLEGE

NURTURING STRATEGIC THINKERS OF STATESMAN QUALITY

THE STATESMAN JOURNAL 2023

Malaysia's Elements of National Power

Vol 1 | Issue 1 | 2023
ISSN 2811 -454X

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AIM AND SCOPE

The Statesman Journal is a product of the National Resilience College (NRC) under the Malaysian Armed Forces and is a prominent platform for academic excellence and thought leadership. This esteemed publication predominantly showcases a variety of original research papers and articles authored by course and faculty members of the NRC. The journal's coverage extends beyond just military or defence issues, delving into a broad spectrum of subjects related to security and strategic studies.

One of the journal's fundamental goals is cultivating a culture of intellectual depth and critical analysis within the Malaysian Armed Forces' ranks and broader academic and strategic circles. The dissemination of research and insights from the NRC enables The Statesman Journal to contribute to shaping and enhancing discussions around national security significantly. Moreover, The Statesman Journal is known for its in-depth, well-researched, and insightful analysis of pertinent topics. Its dedication to maintaining high standards of excellence and relevance elevates it beyond a typical academic journal. It is a valuable resource for a diverse audience, including scholars, strategists, and those engaged in comprehensive study and understanding of strategic issues.

In presenting innovative ideas, diverse perspectives, and potential solutions to contemporary challenges, The Statesman Journal plays a crucial role in enriching the dialogue on national security and strategic matters within Malaysia and in a wider regional context. This makes it an essential contributor to strategic studies, offering rich content that is both informative and thought-provoking.

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THE STATESMAN JOURNAL 2023

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COMMANDANT'S PREFACE

MAJOR GENERAL DATUK HAJI MOHD NIZAM BIN HAJI JAFFAR
COMMANDANT OF NATIONAL RESILIENCE COLLEGE

I am honoured to introduce this edition of the Statesman Journal, an intellectual repository dedicated to nurturing strategic thinkers of statesman quality. This edition focuses on the 8th pillar of National Security Policy, which is People's Security, a topic of paramount significance in the contemporary geopolitical landscape and strategic outlook.

In an era marked by rapid changes and complex challenges, the role of a statesman transcends conventional boundaries of leadership. It demands an astute understanding of the multifaceted dimensions of national power, encompassing military strength, economic resilience, diplomatic acumen, technological advancement, and cultural influence. This journal seeks to unravel these elements through its rigorous and thought-provoking discourse, offering deep and wide-ranging insights. Our contributors, a distinguished cadre of course members and thought leaders, bring a wealth of expertise and perspectives. Their analyses not only dissect the components of national power but also synthesise these elements in the context of global dynamics and regional intricacies. This approach is particularly relevant for Malaysia, a nation that continues to navigate its path on the global stage with strategic finesse and resilience.

Through my years, I have witnessed firsthand the evolution of national security paradigms and the increasing importance of a holistic understanding of power. This journal serves as a beacon of knowledge, guiding current and future leaders in the art and science of statecraft. It reinforces the ethos of the National Resilience College, where the development of strategic acumen is inextricably linked with a deep appreciation of global affairs and national interests. The articles within this edition cover various topics, from the traditional realms of military strategy and economic policies to the emerging frontiers of cyber power and cultural diplomacy. Each piece contributes to a comprehensive understanding of national power and encourages readers to think critically about Malaysia's role and strategy in an interconnected world.

In conclusion, I hope this edition of the Statesman Journal will inspire and challenge you. May it ignite a passion for strategic thinking and a commitment to the noble pursuit of statesmanship. As we forge ahead in these tumultuous times, let us carry the torch of knowledge and wisdom, mindful of our duty to our nation and the global community.

Major General Datuk Haji Mohd Nizam bin Haji Jaffar
Commandant
National Resilience College

NATIONAL RESILIENCE COLLEGE

National Resilience Course

The National Resilience College is the National Centre for Defence Studies senior college of the Malaysian Armed Forces. We provide the capstone to strategic education of those officers of the Armed Forces and in future, equivalent civil servants who have the potential to reach the highest ranks and who must, therefore, understand and be comfortable working at the strategic level across government and in the international environment. The college was established following the strategic vision of the late Yang Amat Berhormat Tun Abdul Razak bin Dato' Hussien's vision of promoting greater understanding between senior military officers, diplomats, civil servants, officials and the corporate sector.

The NRC is a strategic college designed to provide best practices for the highest level of thinking in achieving the nation's grand interest. The course at NRC will be the continuity of studies of the Malaysian Armed Forces Defence College and Malaysian Armed Forces Staff College but with emphasis on high-level studies at the grand strategic level focusing on defence and security of the nation, the region and the world.

Officially, the NRC was established on 31st July 2019 to cater to the professional development of the Malaysian Armed Forces officers of Brigadier General and Colonel in rank or equivalent. The study program is known as the National Resilience Programme, and the academic program is provided in collaboration with the National Defence University of Malaysia (NDUM). The NRC 2024 cohort will span an academic year from 8th January to 8th December 2024 to provide Course Members (CM) with third-level Professional Military Education (PME) in international affairs, security, policy and strategy.

The college course content is designed not entirely on defence studies. Still, the NRC looks at a wide range of factors, including values related to stability, security and prosperity at the national, regional and global levels. The program focuses on the grand national strategic level, at which governments make decisions about their instruments of power as they relate to promoting the nation's national interests.

SECURITY STUDIES

National Resilience Course

In this journal, we delve into the multifaceted concept of national security, expanding beyond traditional military concerns to encompass a range of non-military factors that have grown increasingly prominent in shaping the security landscape. The articles explore how the security agenda has broadened to include critical issues such as internal security, unemployment, health, food and water security, energy and natural resource depletion, environmental degradation, and the risks associated with rapid technological advancements.

The focus extends to the diverse forms of security that have emerged, including economic, environmental, energy, food, and information security. Recognising that concerns about people's daily lives and non-military threats overshadow fears of military conflict, the articles examine national security for the people's security.

Therefore, this journal assesses both military and non-military determinants of national power. It aims to provide readers with insights into how these instruments of power can be orchestrated into cohesive policies and strategies, advancing the country's national interests. The content offers a comprehensive framework for analysing the challenges and prospects facing the state's prosperity, political capacity, and security, thereby contributing to a deeper understanding of the broad spectrum of factors influencing national security in the contemporary world.

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The Statesman Journal
2023, Vol 1 6 - 23
ISSN-2811-454x

NAVIGATING THE COMPLEXITIES OF FOOD SECURITY IN MALAYSIA: STRATEGIES, CHALLENGES AND FUTURE DIRECTIONS

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Abstract

The escalating global food prices have raised profound concerns about food security within Malaysia. This substantial increase in food prices is mainly attributed to events that began with the onset of the COVID-19 pandemic in 2020, followed by ongoing conflict between Russia and Ukraine. Adding to the complexities, the continuous escalation of the US interest rates over the past year has weakened the Ringgit, making food imports more expensive for Malaysia. This situation has seen the food inflation rate in Malaysia reach an average of 6.8% in 2022, causing some of the food and basic item prices to rise by 60%, affecting lower-income households, especially those residing in urban cities. Malaysia's government consistently enhances its efforts and initiatives, including reviewing its food policy to increase the productivity of domestic staple foods and reduce dependence on food imports. Therefore, this study intends to analyse the capacity of the National Agrofood Policy, 2021-2030 (NAP 2.0) initiatives and the roles of parties involved in the food agriculture ecosystem toward achieving a Self-Sufficient Level of domestic food productivity, which will instil public confidence that food is available and affordable for all Malaysians. The study employs a qualitative research methodology based on the data collected from secondary sources such as journals, articles, news, reports and statistics from government agencies. The findings of this study reveal that the National Agro-Food Policy 2.0 strategies and action plans have created a path and capacity to achieve its objectives of increasing the domestic productivity of rice and other staple foods by 2030. Increasing domestic staple foods production requires combination efforts, significant roles, and the ability to shift towards smart technology farming by the parties involved. The study also reveals that the continuous enhancement of integration between four main elements, experienced management, technology, energy and capital, is vital and could contribute to many benefits for the food agriculture ecosystem. Overall, achieving public confidence in the National Food Policy by ensuring food is available and affordable through increasing domestic productivity and reducing food imports requires significant involvement and roles of all parties in the food agriculture ecosystem and Malaysian citizens.

Keywords: *Domestic Staple Foods, Food Agriculture Ecosystem, Food Inflation, Food Security, Malaysia Agricultural Research and Development Institute (MARDI), Ministry of Agriculture and Food Industries (MAFI), National Agrofood Policy, 2021-2030 (NAP 2.0), Smart Technology Farming*

Introduction

The global landscape of food security is facing unprecedented challenges, exacerbated by rapid population growth and various factors impinge upon food production and affordability. This intricate scenario has rendered nations, particularly those reliant on food imports, increasingly vulnerable to threats to food security. The crux of maintaining social stability hinges on the assurance that food remains both accessible and affordable to all citizens. As Long (2022) noted, governmental inaction in the face of escalating food crises, the rise in food prices, and deepening poverty has historically precipitated social unrest.

This underscores the imperative for nations, including Malaysia, to formulate and implement robust policies, strategies, and action plans to fortify food security and cater to their populations' burgeoning demands.

As defined by the World Bank (2023), food security entails universal physical and economic access to safe and nutritious food that meets dietary needs and preferences, underpinning an active and healthy lifestyle. As a fundamental human necessity, food provides the essential nutrition that energises daily human activities. As a developing country, Malaysia confronts significant threats to its food security, arising from its expanding population and the influx of immigrants and refugees. The escalation of global food prices, with a 5.8% increase in 2022, surpassing the overall inflation rate of 3.3% (Bernama, 2023), further exacerbates this precarious situation. The onset of the COVID-19 pandemic in 2020, which disrupted the global agricultural supply chain, marked the beginning of a series of exacerbating factors.

Compounding these challenges, the Russia-Ukraine conflict has precipitated shortages in fertilisers and animal feed, severely disrupting global food and fertiliser markets. This conflict has led to labour shortages, fertiliser scarcities, and uncertainties in harvest outcomes, notably impacting the prices and availability of maise, wheat, vegetable oils, fertilisers, and animal feed globally (Hassen, 2022). Additionally, the weakening of the Malaysian Ringgit, influenced by the US interest rate hikes over the past year, has made importing food more costly for Malaysia, as most imported goods are priced in US dollars. Given this backdrop, policymakers, stakeholders, and citizens must navigate these challenges collaboratively. Achieving food security, where no individual faces hunger, and everyone can lead a healthy, nourished life, necessitates a concerted effort underpinned by strategic policies, meticulous planning, collaborative endeavours, and unwavering commitment. This article explores the multifaceted aspects of Malaysia's food security, delving into the challenges, strategies, and potential pathways to ensure the nation's food security in an increasingly volatile global context.

Challenges and Trends in Achieving Food Self-Sufficiency in Malaysia: A Focus on Rice Production and Import Reliance

In Malaysia, achieving a status of food self-sufficiency, defined as the capability to produce sufficient food for the consumption needs of its populace, presents a complex challenge. Despite a rich diversity of food commodities produced domestically, the country faces a persistent gap between local production and the escalating demand for food. This imbalance necessitates a heavy reliance on food imports, especially for essential commodities such as rice, beef, and dairy. The national production and consumption of rice, a staple food, are quantified by the Self-Sufficiency Level (SSL), which Dorairaj (2023) reports as fluctuating between 67% and 70%. Also, Malaysia imports around 30% of its rice requirements, mainly white and fragrant rice varieties.

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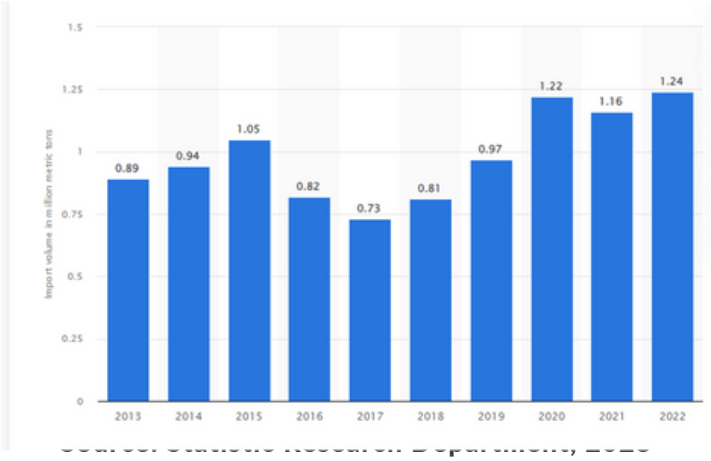
The year 2022 saw a significant rise in rice imports, with volumes reaching approximately 1.24 million tons, an increase from the 1.16 million tons recorded in 2021 (Baron, 2023). Despite this, Malaysia's rice production in 2021 was reported at 1.68 million tons, marking a modest increase of 1.8 thousand metric tons from the previous year. Alongside rice, other food items such as mutton, beef, fruits, and vegetables constitute a substantial portion of Malaysia's food imports. This heavy dependence on imported food has rendered the nation particularly vulnerable to global food supply chain disruptions. These disruptions can stem from various external factors, including geopolitical instabilities, climate change impacts, and economic crises.

The susceptibility of Malaysia's food security to these external factors was starkly highlighted when Padiberas Nasional Bhd (BERNAS) announced a significant price increase for imported white rice. On 1 September 2023, the price was adjusted from RM 2,350 to RM 3,200 per tonne, a change attributed to multiple external factors, including increased operational costs (Birruntha, 2023). This decision reflects the broader challenges faced by Malaysia in maintaining food affordability amidst a volatile global context. Figure 1 provides a visual representation of the volume of rice imported by Malaysia over the past decade, further illustrating the nation's growing reliance on external sources for its staple food supply.

Figure 1: Import Volume of Rice in Malaysia from 2013 to 2022



The escalation in imported rice prices presents significant implications for the broader landscape of food pricing, potentially contributing to increased food inflation. This situation underscores the critical need for Malaysia to enhance its domestic food production capabilities, not only to mitigate the trade deficit but also to bolster food security. Such efforts are pivotal in ensuring a consistent and self-sufficient food supply, which would reinforce public confidence in the nation's food security policies.

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In response to these challenges, Malaysia's Ministry of Agriculture and Food Industries (MAFI) has developed the National Agro-Food Policy 2.0 (NAP 2.0). This policy, designed to supersede the previous National Agro-Food Policy (NAP 1.0), aims to augment the country's food security framework. The inception of NAP 2.0 is a strategic move by the Malaysian government to address the vulnerabilities arising from its dependency on food imports and the inadequacies in domestic food production. This transition is pivotal in Malaysia's journey toward reducing its susceptibility to food insecurity, a concern that has become increasingly prominent in the wake of rising import costs and limited local food production capacity.

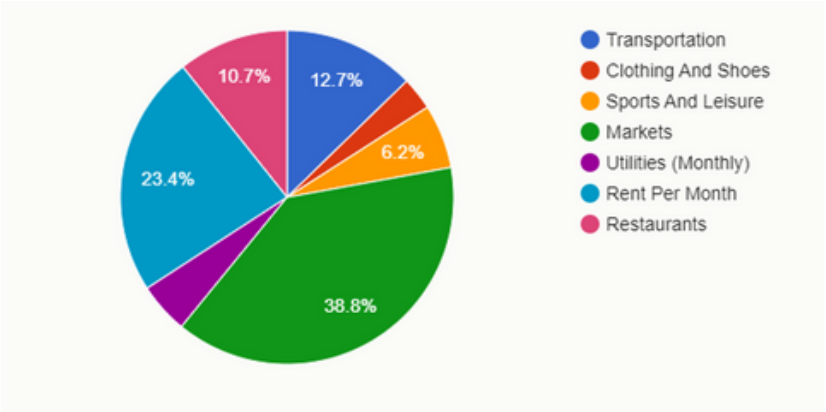
Impact of Global Events on Malaysia's Food Inflation and Its Socio-economic Implications

The global disruptions in energy and food supply chains, notably due to the COVID-19 pandemic and the Ukraine-Russia conflict, have significantly affected food inflation worldwide, including Malaysia. The Department of Statistics Malaysia (DoSM) reported a notable increase in food inflation, which stood at 4.1% in April 2022. This inflation was characterised by an increase in the prices of 89.1% of food and beverage items, as indicated in their 2020 report. Food inflation is the progressive increase in food prices over time, leading to a corresponding reduction in consumer purchasing power, particularly for food products.

This inflationary trend has tangible impacts on consumer expenditure, particularly in the context of essential food items. For instance, the price of chicken in Malaysia witnessed a significant rise of 17%, reaching RM 10 per kilogram in June 2022, as highlighted by Sani (2022). Such increases in the prices of food and other essential items contribute to an escalation in the monthly expenditure of households. The lower-income groups disproportionately feel this effect, specifically those within the B40 category and below. The burden is particularly acute in larger urban areas like Kuala Lumpur, where the cost of living is typically higher. Households with substantially lower income scales face more significant challenges in coping with these rising costs.

The impact of food price inflation is further elucidated by data from Numbeo.com, which indicates that households in Kuala Lumpur allocate as much as 38.8% of their spending on market purchases, as depicted in Figure 2. This statistic underscores the significant portion of household budgets consumed by food expenditures, highlighting the vulnerability of lower-income households to fluctuations in food prices. The situation calls for a concerted effort by policymakers and stakeholders to address the challenges posed by food inflation, particularly in urban areas, to mitigate its adverse effects on the socio-economic well-being of the affected populations.

Figure 2: Distribution of expenses in Kuala Lumpur (2023)



Source: Numbeo.com

Escalating Urban Living Costs in Malaysia: Food Inflation and its Impact on Household Expenditure

Rising living costs, particularly in urban areas, is a critical issue of concern in contemporary Malaysia. Ismail (2022) defines the cost of living as the minimum expenditure a household must incur periodically to maintain its standard of living. In his study, Ismail emphasises that an increase in the costs of necessities can significantly elevate overall living expenses, directly impacting household well-being. This situation is exacerbated by the increase in raw materials, gas, and transportation prices, which has compelled many restaurants to raise their menu prices to sustain their food service operations and net profit margins.

Increasing food prices, a primary component of urban living costs, profoundly affects household budgets. In urban settings, families often allocate a substantial portion of their income to procure the same quantity of food, resulting in a marked reduction in their purchasing power. The 2019 Household Expenditure Survey (HES) by the Department of Statistics Malaysia (DoSM, 2020) reveals that 17.3% of the consumption expenditure of B40 households is dedicated to food and non-alcoholic beverages. However, with the ongoing trend of rising food prices, commonly referred to as food inflation, it is anticipated that this segment may soon find itself spending over 25% of its income on food alone. The impact of high food inflation is twofold: it accelerates the cost of essential food items and diminishes the purchasing power of households, thereby inflating their food expenditure. This dynamic is particularly pronounced in urban households, where the cost of living is generally higher. A report by Numbeo.com on 25 August 2023 presents a comparative analysis of staple food prices in small towns versus urban cities, as shown in Table 1.

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The comparison highlights a significant disparity in the cost of essential food items between these areas, with urban residents bearing the brunt of these increased expenses. The data from this report underscores the pressing need for policy interventions to address the challenges of food inflation and its ramifications on the economic stability of urban households in Malaysia.

Table 1. Comparison of Food Prices between a Small City and an Urban area

Items	Alor Setar (RM)	Kuala Lumpur (RM)
Restaurant Meal/pers	6.50	15.00
Restaurant Meal/Family	90.00	122.50
Rice/kg	4.94	5.79
Chicken Fillets	13.00	18.86
Eggs (10)	5.60	8.15
Tomato	6.60	7.00

Source: Numbeo.Com

Socio-economic Impact of Food Inflation on Nutritional Choices and Health in Urban Malaysia

The escalating cost of food commodities profoundly impacts food affordability, particularly for individuals from low-income brackets. Such economic pressures render them susceptible to hunger, unhealthy dietary choices, and associated health issues. Awang (2022) posits that high food prices often deter people from purchasing healthier options like fruits, vegetables, and lean proteins. Consequently, dietary patterns shift towards more affordable but less nutritious alternatives. These alternatives typically consist of foods high in trans fats, sugars, and processed meats, all lacking essential nutrients and contributing to poor health outcomes.

The implications of such dietary changes are far-reaching, with an unhealthy diet being a key contributor to the prevalence of overweight and obesity. While fast food offers a quick energy source, its long-term consumption harms health and leads to various diet-related diseases. The World Health Organization (WHO) documented a significant increase in obesity rates in Malaysia, rising from 17.7% in 2015 to 19.9% in 2019 (Tat, 2023). Obesity is a known risk factor for various chronic conditions such as stroke, diabetes, hypertension, and cardiovascular diseases. Furthering this concern, Tan (2023) reported that the easy accessibility of high-calorie foods among lower-income groups in Malaysia has resulted in 50.1% of adults being overweight or obese. Therefore, food inflation affects economic well-being and forces low-income populations to opt for food options deficient in essential micronutrients, adversely impacting their overall health.

Additionally, poor nutrition can significantly hinder growth, cognitive development, and academic performance among children and students. Therefore, in Malaysia's broader context of food security, this discussion highlights several key factors. Firstly, the rising food prices have substantially impacted lower-income and urban households, compelling them to shift their diets from nutritious options to more affordable but less healthy fast and processed foods. This shift has contributed to an increase in overweight and obesity rates among Malaysian adults, escalating the risk of non-communicable diseases (NCDs).

Secondly, the demographic shift from rural to urban areas has increased city population density, altering eating habits and increasing the demand for various food products. This change in dietary preferences necessitates a more efficient agricultural system to meet the growing food demand. In response, the Malaysian government, through the Ministry of Agriculture and Food Industries (MAFI), has implemented strategies to lower food prices and enhance food availability and affordability. This includes the introduction of the National Agro-Food Policy 2.0, aimed at boosting food productivity, nutrition, economic growth, and the overall well-being of Malaysians. The policy seeks to achieve self-sufficiency and reduce food imports by increasing domestic food production addressing food security challenges in an evolving socio-economic landscape.

Enhancing Food Security in Malaysia: Policy Initiatives and Strategic Goals for Agro-Food Sector Development

Malaysia's ranking in the Global Food Security Index (GFSI) experienced a decline, dropping seven places to 41st in the latest assessment. This change reflects the country's ongoing challenges in stabilising domestic food production and its continued reliance on imports despite being deemed food secure by the index. While there has been a marginal improvement in self-sufficiency levels for rice, vegetables, fruits, beef, mutton, and liquid milk, these remain insufficient to meet domestic needs fully. From 2010 to 2020, Self-Sufficiency Levels (SSL) for rice, vegetables, and poultry eggs have increased, whereas other major agro-food commodities have experienced a decline.

In 2020, rice production accounted for 63%, vegetables for 51.5%, beef for 21.2%, and fisheries for 93.5% of local consumption (MAFI, 2021). Malaysia relies heavily on food imports to bridge the gap between domestic production and demand, leading to a widening deficit in the agro-food trade balance. The Department of Statistics Malaysia (DoSM) reported a deficit of RM25 billion in 2021, with agro-food imports amounting to RM64 billion against exports of RM39 billion. Over the past decade, food imports have totalled RM482.8 billion, while exports have reached RM296 billion.

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In response to these challenges, Malaysia has formulated various agro-food policies to enhance the domestic productivity of essential foods to achieve greater self-sufficiency and reduce reliance on imports. A key initiative in this direction is the launch of the National Agro-Food Policy 2021-2030 (NAP 2.0) by the Ministry of Agriculture and Food Industries (MAFI) in 2021. This policy, which replaces the earlier National Agro-Food Policy 1.0 (NAP 1.0), is geared towards developing a sustainable and resilient agro-food sector, embracing high-technology approaches, and ensuring food security and nutrition. NAP 2.0 is structured around six policy objectives, supported by five policy thrusts, encompassing 21 strategies and 77 action plans.

The policy focuses on modernisation and smart agriculture, market and product access enhancement, human capital development, sustainability of the food system, and fostering conducive business ecosystems and governance. Specifically, NAP 2.0 targets increased production in four subsectors: paddy and rice, fruits and vegetables, livestock, and fisheries. Furthermore, NAP 2.0 sets ambitious goals to elevate domestic productivity by improving SSL in crucial areas. The target is to raise the SSL of rice from 63% in 2019 to 75%, vegetables from 44.6% to 70%, fisheries from 93% to 95%, and beef from 22.3% to 50% by 2025 (MAFI, 2021).

Thus, this study focuses on the policy thrusts and strategies designed to achieve the specific objective of 'Raising Production Output with Quality Harvest', emphasising increasing the productivity of four staple foods, using rice as a case study. The 'Embrace of Modernization and Smart Agriculture' is a critical policy thrust contributing to this objective. Table 2 in the accompanying document highlights the targeted SSL for 2025 and 2030, delineating the strategic milestones set by NAP 2.0 in its pursuit to bolster Malaysia's food security.

Table 2: Self-Sufficiency Level

Major Food Commodities	2019 (%)	2025 (%)	2030 (%)
Rice	63.0	75.0	80.0
Vegetables	44.6	70.0	79.0
Poultry Meat	104.1	120.0	140.0
Poultry Egg	119.1	114.0	123.0
Fish	93.0	95.0	98.0
Beef	22.3	50.0	50.0

Source: Ministry of Agriculture and Food Industry Policy

NAVIGATING THE COMPLEXITIES OF FOOD SECURITY IN MALAYSIA: STRATEGIES, CHALLENGES AND FUTURE DIRECTIONS

Technological Advancements in Malaysian Agriculture: NAP 2.0's Approach to Enhancing Food Productivity

Malaysia's National Agro-Food Policy 2.0 (NAP 2.0) significantly emphasises integrating technology and innovation to boost agricultural productivity. A key focus of this policy is the adoption of modern farming methods by small-scale farmers, who constitute over 80% of the nation's agro-food producers, as identified by Elini (2023). Given the predominant role of small-scale farmers in Malaysian agriculture, Lee (2021) has underscored the importance of these farmers embracing agricultural technology (agri-tech) to enhance both the quality and quantity of crop yields.

The application of smart agricultural technologies is pivotal in assisting food producers to predict and manage pest and disease issues more effectively, thereby improving the output of both crops and livestock. Yue (2022) notes the potential of technology explicitly in increasing the productivity of rice farmers while simultaneously reducing the required time and labour. Integrating digital solutions, artificial intelligence (AI), the Internet of Things (IoT), and Agriculture 4.0 technologies is poised to transform the Malaysian agricultural sector. Such advancements can lead to reduced food imports, improved livelihoods for farmers, and heightened efficiency in yield production and supply chain management.

Agricultural agencies like the Malaysia Agricultural Research and Development Institute (MARDI) play a crucial role in facilitating the adoption of such technologies. MARDI has been actively implementing programs to assist paddy farmers in incorporating new technologies into their practices. One notable initiative is the MyPadi Manager mobile app, which has aided 200 farmers in managing paddy cultivation more efficiently and systematically (Businesstoday, 2020). Additionally, MARDI has been instrumental in introducing and promoting technological innovations such as land levelling machines and drones for seed sowing, which enhance seed germination rates. Moreover, MARDI's fertilising technologies have effectively reduced pest and disease attacks caused by improper fertiliser use, leading to time and cost savings and increased paddy yields (Rahim, 2018).

Beyond rice production, MARDI has also made strides in cultivating high-value vegetables by developing a small-scale or container-type plant factory known as AgroCube. This initiative, coupled with training programs for young agropreneurs and financial support from Agrobank, underscores the holistic approach taken by Malaysia in modernising its agriculture sector (Dardak, 2022). Yue (2022) highlights the importance of government and agency support in leveraging technology to increase the domestic rice supply. Furthermore, Azizol et al. (2023) emphasise that farmers recognise the benefits of using technology, particularly drones, in rice cultivation and paddy field management, noting efficiency, productivity, and profitability improvements.

NAVIGATING THE COMPLEXITIES OF FOOD SECURITY IN MALAYSIA: STRATEGIES, CHALLENGES AND FUTURE DIRECTIONS

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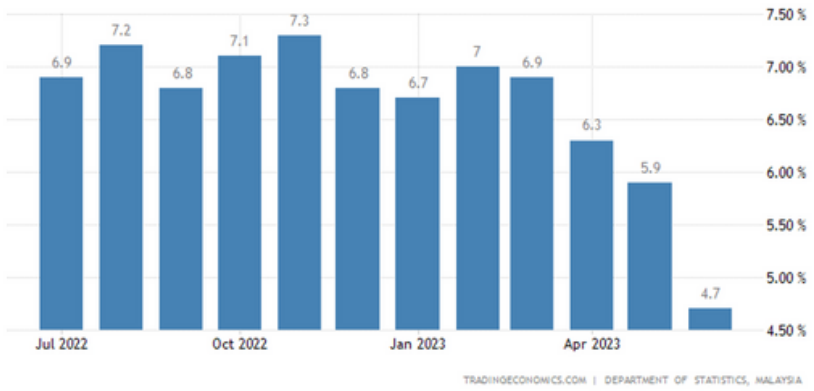
Implementing NAP 2.0's 'Embrace Modernisation and Smart Agriculture' strategy has led to tangible crop yield quality and quantity improvements. This policy direction is instrumental in increasing domestic rice productivity to a 75% Self-Sufficiency Level (SSL) by 2025, alongside other staple foods. The success of NAP 2.0 is reflected in the recent trends in food inflation, with the Department of Statistics Malaysia (DoSM) reporting an annual food inflation rate of 4.7% in June 2023, a decrease from 5.9% in May and the lowest since April 2022 (Figure 3). This reduction in food inflation rates points to greater stability in food prices and an improvement in the population's purchasing power, marking a positive stride towards achieving the objectives of NAP 2.0.

Figure 3: Annual Food Inflation Rate



Source: Department of Statistics Malaysia

Enhancing Malaysia's Agricultural Sector: The Roles of Regulatory Bodies and R&D Agencies in Achieving Food Security

The Malaysian agricultural sector, facing various challenges, necessitates focused attention from the government and stakeholders. With a growing population projected to reach 44.4 million by 2050, Malaysia is pressured to double its food production to ensure adequate supply.

This task requires the concerted efforts of regulatory bodies, agricultural agencies, food processors, and farmers to foster agricultural sustainability and self-sufficiency. A resilient and prosperous agricultural industry capable of meeting future demands hinges on cooperation, information exchange, and a unified commitment to sustainable practices. Each entity involved must actively promote sustainable practices and work towards preserving the long-term viability of the agricultural ecosystem.

Ranking 41st in the 2022 Global Food Security Index, Malaysia, through the Ministry of Agriculture and Food Industries (MAFI), is focused on enhancing domestic food production and reducing reliance on imports. As a regulatory body, MAFI is crucial in formulating sustainable agricultural policies and regulations. These policies are instrumental in setting environmental standards, fostering sustainable practices, boosting productivity, and enhancing the welfare of food producers, mainly small-scale farmers. Syukrie Mohd Nasir, MAFI Assistant Secretary, stated that the ministry had developed several critical initiatives, including the National Agrofood Policy 2.0 (NAP 2.0), the National Food Security Plan 2021-2025, and other strategies to achieve Malaysia's food security objectives (Editor, 2023).

Dardak (2020) observed that implementing these policies and strategies is pivotal in augmenting food production and addressing food security in Malaysia. However, Wong (2022) pointed out a shortfall in collaboration among Malaysian government bodies to drive the National Food Security agenda effectively. While MAFI focuses primarily on agriculture, the author advocates for a more holistic approach encompassing the entire food production-to-consumption chain. Syukrie mentioned MAFI's collaboration with the World Bank and various ministries and organisations to enhance food productivity and achieve national food security goals (Editor, 2023). With the comprehensive ten-year plan of NAP 2.0 (2021-2030) and the National Food Security Plan (2015-2025), the Malaysian government, through MAFI and its affiliated agencies, is continually strengthening its role as a regulatory body, providing guidance and strategic direction to various parties in the food ecosystem.

Governmental agricultural agencies are tasked with conducting research and development (R&D) to improve the agricultural ecosystem and the welfare of farmers. The Malaysia Agricultural Research and Development Institute (MARDI), operating under MAFI, is at the forefront of such efforts. MARDI's commitment to investing in agricultural R&D aims to promote innovation, encourage technology adoption, and propagate best practices among food producers. This is crucial for enhancing productivity, reducing costs, and benefiting the environment. Bala (2014) recommended that the Malaysian government prioritise R&D in developing new paddy breeds resilient to disease and other challenges while boosting productivity.

MARDI focuses on developing smart farming techniques, leveraging the Internet of Things (IoT), drones, robotics, and AI to enhance product quality and quantity while minimising labour and cost (PRODATA, 2023). The concept of "precision farming," particularly in rice cultivation, is a significant aspect of smart farming. Furthermore, MARDI is exploring new environmental management methods for agricultural resources such as soil, water, and genetics (MARDI, 2023). In essence, MARDI's mandate is to contribute to agricultural development by applying technology, primarily focusing on using smart farming concepts to improve farm management, aligning with the National Agro-food Policy 2.0's thrust to Embrace Modernisation and Smart Agriculture.

Collaborative Strategies for Strengthening Malaysia's Agro-Food Ecosystem: Roles of Agribusiness Agencies, Food Processors, and Producers

Within the National Agro-Food Policy 2.0 framework, agribusiness agencies like the Federal Agricultural Marketing Authority (FAMA) are pivotal in promoting agribusiness and attracting investment to the agro-food ecosystem. Despite agriculture accounting for only 1.5% of the Foreign Direct Investment (FDI) net inflow in 2021, equating to RM 0.7 billion, this sector has a significant opportunity for growth. Wong (2022) highlights the constraints faced by small-scale farmers and entrepreneurs, particularly in funding for research and development (R&D) and technological innovation, which limit agricultural productivity and hinder the achievement of food security goals.

The government has established strategic public-private partnerships to address these challenges, exemplified by the collaboration between MAFI's Felcra and British American Tobacco Bhd (BAT Malaysia) for developing underutilised agricultural land (Nizam, 2023). Moreover, MAFI's development of the Rural Transformation Centre (RTC) modern market through FAMA, incorporating government-private sector partnerships, is a testament to these efforts (FAMA, 2023). Additionally, the collaboration between MARDI and Maybank, formalised in an MoU in June 2023, aims to foster innovation and sustainability in urban agriculture (Maybank, 2023). These government-led initiatives are crucial in promoting public-private collaboration, supporting agribusiness, and advancing the goal of creating a conducive business ecosystem and robust institutional framework for national food security.

Food processors and retailers are essential in reducing food waste, a critical aspect of achieving food sustainability. Optimising inventory management and adopting new packaging technologies can significantly decrease food wastage. Simm's (2020) study underscores the necessity for food processors and retailers to embrace modern technology to reduce waste and enhance environmental sustainability. The author advocates for policymakers and responsible agencies to encourage the adoption of these technologies to increase food availability.

Norkumala (2022) emphasises the importance of innovative packaging technologies, such as Retort, in preserving food quality and extending shelf life. Therefore, food producers and retailers must invest in technological advancements for food preservation, waste reduction, and nutritional content improvement, particularly during storage. Agencies like MARDI should guide and support these sectors in utilising new food processing and management technologies, especially packaging and storage, to maintain food quality and minimise waste. Farmers and agricultural producers are at the forefront of the industry and are crucial in driving its sustainability.

The adoption of sustainable practices, coupled with the utilisation of technology, is essential for maximising resources and minimising costs and labour. Innovations such as drones, climate-controlled greenhouses, precision farming, and efficient water and resource management are crucial to improving agricultural management, product quality, and quantity. Elini (2023) notes that small-scale paddy farmers use technology and mechanisation moderately. MAFI encourages farmers to employ machinery and new technologies, particularly in paddy cultivation, to enhance productivity and reduce costs (Elini, 2023). Shukor (2021) points out that a significant barrier to adopting modern farming technology among small-scale farmers is the need for more funding or capital. Sustainable agriculture also involves organic farming methods, minimising chemical inputs, and adopting efficient water and fertilisation techniques to reduce waste and increase productivity.

Therefore, successfully implementing the National Agro-food Policy 2.0 by 2025 necessitates a collaborative approach involving all stakeholders in the food ecosystem, including government agencies, food processors, and farmers. By working together, these entities can forge a more resilient and sustainable agricultural industry that meets Malaysia's food security needs.

Integrating Experience, Technology, Energy, and Capital for Sustainable Agricultural Development in Malaysia

Effective experience management plays a crucial role in optimising agricultural practices. It involves leveraging the collective knowledge and expertise of experienced farmers and agricultural professionals. These individuals are a vital source of best practices, traditional knowledge, and innovative methods, which can significantly enhance crop yields, pest and disease management, and efficient use of water and other resources. Janc (2015) underscores the importance of sharing agricultural knowledge and expertise, noting that it can lead to increased production and improved economic performance of farms. Johnson (2022) highlights that modern agriculture has become increasingly knowledge-intensive, necessitating the need for food producers to be well-informed and experienced. Therefore, experienced farmers and MARDI professionals are encouraged to impart good agricultural practices to small-scale and young farmers.

Platforms such as agriculture forums, seminars, and practical advice sessions effectively disseminate knowledge and experience. The adoption of technology in agriculture, including precision farming, automated irrigation systems, drone surveillance, and smart sensors, can significantly boost yields, reduce waste, and improve resource management. Technological innovations are also vital in enhancing post-harvest handling, storage, and processing, reducing losses and increasing food availability. Suprem (2013) discusses the role of wireless networking technology, soil sampling, variable-rate fertilisation, and various other technological applications in improving agricultural productivity.

The Malaysian National Agro-Food Policy 2.0 emphasises the importance of technology in managing pests and diseases more effectively, thus enhancing predictability and efficiency in animal rearing and crop production. R&D in technology by agencies like MARDI is crucial for increasing food productivity and quality. The agricultural sector accounts for approximately 30% of global energy use, primarily for irrigation pumps, farm machinery, processing, and fertiliser equipment, powered mainly by fossil fuels (FAO, 2021). Farmers are encouraged to transition to renewable energy sources to enhance energy efficiency and reduce operational costs. Implementing solar or bioenergy systems can decrease reliance on fossil fuels and electricity, contributing to sustainable agriculture and cost savings. Herbert (2019) points out the potential of biomass, geothermal, hydroelectric, solar, and wind power in powering various farm operations.

Thus, adopting renewable energy in agriculture is critical to reducing fossil fuel use and operational expenses. Capital, encompassing savings, credit, and assets, is fundamental for agricultural development (Adams, 2023). It facilitates constructing and improving infrastructure like irrigation systems and agricultural greenhouses and supports adopting technology and sustainable practices. Access to funding enables farmers and the agricultural value chain to operate more efficiently, increasing productivity and incomes. The collaboration between MAFI and Agro Bank, providing RM 110 million to support the food industry and small-scale farmers, exemplifies the role of capital in modernising the agri-food industry under NAP 2.0 (Agrobank, 2021). Capital investment covers operating costs such as seeds, fertiliser, and labour and funding agricultural technology development. Therefore, adequate financial resources are essential for farmers to enhance their farming operations and management, ultimately leading to improved productivity, earnings, and living standards.

Conclusion

The discussions surrounding Malaysia's journey towards improved food security highlight a multifaceted approach encompassing experience management, technological innovation, energy efficiency, and capital investment.

NAVIGATING THE COMPLEXITIES OF FOOD SECURITY IN MALAYSIA: STRATEGIES, CHALLENGES AND FUTURE DIRECTIONS

At the core of these efforts lies the National Agro-Food Policy 2.0 (NAP 2.0), a strategic framework designed to address the nation's agricultural sector's myriad challenges and achieve self-sufficiency in essential food commodities. Experience management has emerged as a critical tool for optimising agricultural practices. Sharing knowledge and expertise from seasoned farmers and professionals enhances crop yields, pest and disease control, and efficient resource utilisation. This collaborative learning process fosters a culture of continuous improvement and strengthens the resilience and productivity of farmers, mainly small-scale and young entrants to the sector.

Technological advancements are central to Malaysia's agricultural transformation. Precision farming, automated irrigation systems, drone surveillance, and smart sensors represent a paradigm shift in farming, offering the potential to boost yields, reduce waste, and improve resource use. These technologies and improved post-harvest handling and processing methods are crucial in increasing food availability and reducing losses. Energy efficiency in agriculture is another pivotal aspect, especially given the sector's significant energy footprint. Transitioning to renewable energy sources, such as solar and bioenergy systems, offers a sustainable path forward, reducing reliance on fossil fuels and operational costs while contributing to global environmental goals. Capital investment is the linchpin that enables these transformative changes. Adequate funding is necessary not only for infrastructural development and technology adoption but also for ensuring the operational efficiency of the agricultural value chain. Strategic partnerships and financial support mechanisms, such as the collaboration between MAFI and Agro Bank, underscore the commitment to providing the necessary financial resources for modernising the agri-food industry.

In conclusion, Malaysia's path to food security is complex and requires a holistic, integrated approach. By combining the wealth of experience within the farming community, harnessing the power of technology, embracing energy-efficient practices, and securing necessary capital investments, Malaysia is well-positioned to achieve its food security goals. The success of these efforts will ensure a stable food supply for the nation and contribute to its population's overall economic growth, environmental sustainability, and well-being.

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The Statesman Journal
2023, Vol 1 25 - 46
ISSN-2811-454x

FOSTERING GROWTH IN SCIENCE, TECHNOLOGY AND INNOVATION FOR BOLSTERING TOTAL DEFENCE (HANRUH)

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Abstract

The research investigates the Total Defence (HANRUH) concept employed in Malaysia, which the National Security Committee presented in May 1986 to develop comprehensive blockage tactics. The study uses a qualitative library research approach and the SWOT analysis to examine the impact of Science, Technology, and Innovation (STI) on Malaysian government readiness in HANRUH. The research systematically evaluates and analyses relevant scholarly works, books, articles, and reports to examine the practical, acceptable, and appropriate techniques for implementing STI policies to improve the effectiveness of HANRUH in Malaysia. The study starts with an Analytical Framework to answer the research questions and define Total Defence. It examines the parallels and differences between Singapore's Total Defence and Malaysia's HANRUH concepts. The paper explains how STI contributes to each of the five pillars from Malaysia's perspective, emphasising the importance of continuing STI investment for Malaysia's security and prosperity. It also investigates how STIs may adequately promote people's security while boosting Total Defence. The findings indicate that Malaysians are concerned about implementing the HANRUH concept and tackling concerns through the National Security Council's long-standing tasks. The Federal Government is making a robust strategic effort to guarantee that Malaysia's sovereignty is adequately protected. The study dives into the numerous applications of STI across multiple defence components, emphasising the importance of this integration for the nation's security and resilience. The study's suggestions and next steps imply that embracing STI through social media platforms is critical to supporting HANRUH. The research and results indicate the Malaysian government's readiness for HANRUH and its theoretical and practical ramifications.

Keywords: *Defence Policy, Defence Strategy, Malaysia, National Security, Science, Technology, and Innovation (STI), Total Defence (HANRUH)*

Introduction

Science, Technology, and Innovation (STI) have emerged as essential ingredients in enhancing a nation's progress and security, empowering nations to strengthen their Total Defence strategies. In Malaysia, the recognition of the importance of STIs is evident in its visionary policies, aiming to become a high-technology nation by 2020. While the aspiration has not been realised within the given time frame, the commitment to STI remains steadfast, exemplified by the formulation of the National Policy on Science, Technology, and Innovation 2021-2030. With a fresh impetus and the acknowledgement of innovation inefficiencies, Malaysia strives to leverage STI effectively, bolstering people's security and contributing to the nation's socio-economic development.

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This article explores the five pillars of Total Defence. It analyses the strengths, weaknesses, opportunities, and threats of the current state of STI in Malaysia in implementing Total Defence and its impact on people's security. It also examines the feasibility, acceptability, and suitability of the identified STI policies to enhance the effectiveness of Total Defence in Malaysia, envisioning a secure and progressive nation at the forefront of technological advancement. The concept of HANRUH, Pertahanan Menyeluruh in short, was formally introduced in 1986 by the National Security Committee to plan solid obstruction.

However, most Malaysians are still in the dark about HANRUH as a whole and in practice. HANRUH, or Total Defence, as stipulated by the Malaysia National Defence Policy (NDP) 2010, is the strategic cooperation of the population in defending the nation in support and complementing the Malaysian Armed Forces (MAF) military response. HANRUH emphasises efficient use of human resources, economic stability, integrated actions from all government agencies, and creating good regional and international cooperation as a strategy to preserve the nation's integrity and sovereignty all the time. The governing principles of HANRUH are national vigilance, solidarity and unity of the community, public vigilance, economic fortitude, and psychological resilience. HANRUH is mentioned in the NDP 2010, specifying HANRUH to mean the total and integrated involvement of all levels of society, be it government agencies, the private sector, NGOs, or the ordinary citizens, all responding to relief efforts during conflict or disaster, complementing the efforts of the MAF.

Meanwhile, the HANRUH approach is also advocated as the Strategy National Security Policy (NSP) 2021-2025, launched on 13 Jul 2021 by the Prime Minister and devised by the National Security Council (NSC). HANRUH, as defined in the NSP, highlights its significance in fostering the spirit of self-reliance and accentuates its importance as the cornerstone of a collective national defence against threats to national security (Jong, C.B., 2021). Scholars Mahnken, Ross, and Tai (2021) define defence innovation as translating ideas and knowledge into novel or enhanced products, procedures, and services with applications both for military and dual-use purposes. Building upon this understanding,

Bowen (1997), in his article titled 'Total Defence - What Is Being Defended and What Are the Threats?', underscores the imperative for all sovereign nations, particularly those of small states, to actively cultivate their unique identities and demonstrate their capabilities in safeguarding their freedoms and sovereignty rights. Integral to this endeavour is the maintenance of national integrity, which serves as the linchpin for recognition within the international arena. The author further contends that a nation-state's integrity hinges upon its capacity to uphold its identity.

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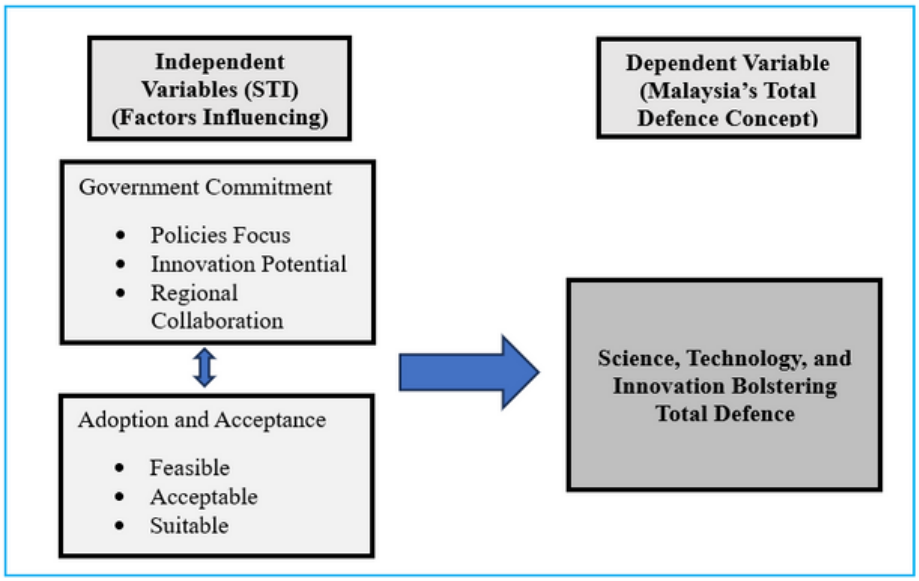
This multifaceted and dynamic concept can evolve, adapting to new circumstances and opportunities. In this context, 'defence' emerges as a paramount term encapsulating the preservation of a nation's identity, often in the face of traditional threats that typically necessitate the leadership of military forces. It is imperative to recognise that achieving this goal demands a comprehensive national defence effort that extends beyond the military sphere, involving the coordinated participation of all governmental agencies and segments of society. This holistic approach, often called a "Whole-of-Government and Whole-of-Society" (WoGoS), exemplifies the collective commitment required to safeguard a nation's identity and integrity.

Theoretical Framework

Figure 1: Government Commitment, Adoption and Acceptance of Science, Technology, and Innovation for Bolstering (STI) Total Defence



The relationship among the factors influencing the relevance of STI within the context of the national HANRUH concept, as illustrated in Figure 1, is a product of extensive scholarly research and analysis. It is essential to emphasise that this conceptual framework was developed based on a comprehensive review of the relevant literature. The positioning of variables within the figure reflects the insights gleaned from the literature readings, demonstrating the interconnectedness and significance of these factors in shaping the dynamics of STI's relevance in the context of the national HANRUH concept. Hence, the relationship among the factors impacting the significance of STI within the framework of the national HANRUH concept has been distilled and elucidated through the illustrative representation presented in Figure 1.

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The provided theoretical framework, as shown in Figure 1, delineates a structured approach to assess the impact of Science, Technology, and Innovation (STI) on Malaysia's Total Defence Concept. It establishes a relationship between independent variables—factors that are posited to influence the outcome—and the dependent variable, which in this case is the efficacy of Malaysia's Total Defence strategy. At the heart of the framework lie the independent variables related to STI. These encompass the Government Commitment, characterised by the focus on policies on STI, the potential for innovation within the country, and the extent of regional collaboration in technological advancements. Such commitment is further dissected into policy focus, which directs attention to the strategic priorities set by the government for STI; innovation potential, which gauges the capability for technological development; and regional collaboration, which evaluates the cooperative efforts in STI within the broader geographical context.

Additionally, the adoption and acceptance of STI within the defence sector are considered crucial independent variables. This includes assessing whether STI initiatives are feasible, reflecting their practical acceptability, indicating the level of endorsement from stakeholders, and ensuring they meet the specific requirements of the defence sector. The dependent variable in this framework is Malaysia's Total Defence Concept, a multifaceted strategy encompassing military, economic, psychological, and social defence aspects. The hypothesis posits that the independent variables related to STI directly strengthen this defence concept. The theoretical model, therefore, suggests a critical assertion: Science, Technology, and Innovation are instrumental in bolstering the Total Defence Concept. The framework implies that the effectiveness of Malaysia's defence strategy is contingent upon the successful integration and application of STI. The relationships depicted through the arrows indicate that a concerted effort in STI, characterised by robust government support and a positive reception within the defence community, will likely enhance the nation's defence capabilities.

In essence, this framework provides a conceptual lens through which the role of STI in strengthening national defence readiness can be examined, highlighting the significant influence of governmental support, regional cooperation, and the adoption of innovative technologies on Malaysia's security measures. Theoretically, this paper is viewed from a realist perspective. It explains how the realist theorists see the state as a unitary actor focused on security and survivability. States are sovereign because there is no competing governmental authority in the international system to enforce and promise to provide protection (Grieco, Joseph M., 1988). Nonetheless, sovereignty entails that the state decides how it will cope with its internal and external problems (Quinn, R. and Gibson, B., 2017). Furthermore, sovereignty only requires states to be responsible for what happens within their borders, as the international system is defined by anarchy.

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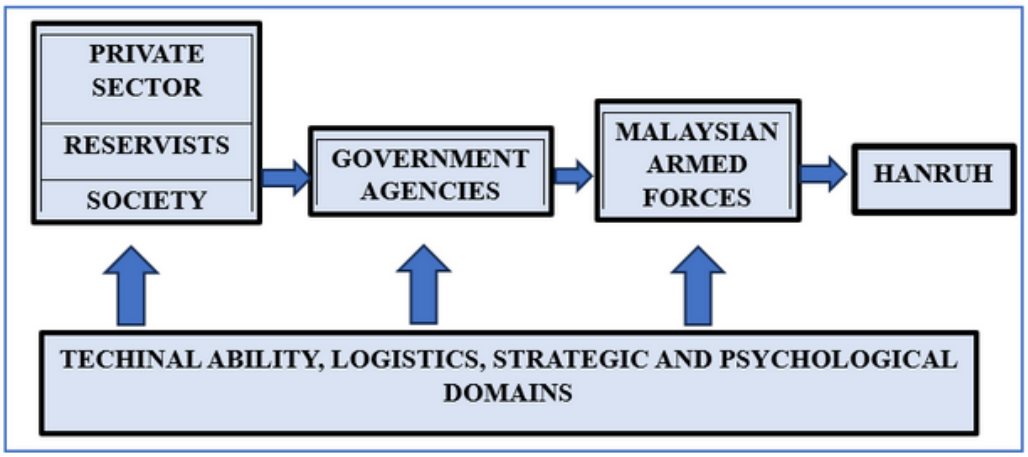
Therefore, based on this theory, it is foreseeable to say that the purpose of defence strategies such as HANRUH, which has been adopted for the past forty years, is an individual state effort to preserve its sovereignty and integrity as an independent state by its population and means without relying on the others. The government has also defined the concept of total defence HANRUH in the NDP. HANRUH has been approved by the NSC, adding value to implementing KESBAN, orchestrated by the National Movement Council known as Majlis Gerakan Negara (MAGERAN) since 1970. The concept of HANRUH is a defence strategy that collaborates and integrates the responsibility of the military and non-military components, involving the people to safeguard the nation's security. This concept was introduced in May 1986 and features the activation of security forces and public defences from every organisation (Siang, 2019).

HANRUH's objective is to extend the utilisation of the country's assets through the integration of economic, social, political, psychological, and civil defence domains, as well as military defence systems, to strengthen the country's defence capabilities. The involvement of the people, government agencies, and MAF is a model developed in the 1980s, as per Figure 2, to implement combined defence efforts integrating the MAF, government and private agencies, and the community. This defence concept relates to the total and integrated efforts undertaken by the government, non-governmental agencies, and the private sector. It requires the commitment of all the people, including the MAF, to defend the country. Thus, through this concept of total defence, the responsibility to ensure national security has become the obligation of all sectors and societies, as articulated through the pillars of Malaysia HANRUH (Sulaiman and Keling, 2022).

Figure 2: Model of HANRUH



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The HANRUH model depicted in Figure 2 outlines the structure and flow of collaboration and influence among different sectors in Malaysia as they contribute to the nation's Total Defence concept, HANRUH. The model starts with three foundational blocks representing the diverse yet interconnected sources of support for national defence: the private sector, reservists, and the broader society. These elements are crucial as they provide a range of resources, expertise, and personnel that bolster the defence capabilities of a nation.

The private sector contributes through technological advancements and industrial support; reservists bring military expertise and a ready reserve force; and society contributes through public support and civil resources. These foundational sectors interface directly with government agencies, indicating a two-way interaction where policies, resources, and strategic guidance flow from the government to the foundational sectors, and support and compliance flow back to the government. This relationship signifies the importance of a cohesive national approach where all sectors work with government strategies to enhance the country's defence readiness. The influence and resources from the government agencies are directed towards the Malaysian Armed Forces, the primary executors of the HANRUH model. The Malaysian Armed Forces are the central pillar of this model, as they are responsible for directly implementing defence strategies and operations.

Underpinning these interactions are technical ability, logistics, strategic planning, and psychological operations. These domains represent the multifaceted aspects of defence readiness, each contributing to the overall strength and efficacy of the HANRUH concept. Technical ability and logistics are critical for the operational aspect, strategic planning ensures the coherence and direction of defence activities, and psychological operations are vital for maintaining morale and public support. Therefore, the culmination of this model is the HANRUH concept, which is the overarching strategy for total defence in Malaysia. This model suggests that the success of HANRUH relies on the integrated support and contributions from all levels of society and sectors of the economy, orchestrated through and by government agencies and executed by the Malaysian Armed Forces. The arrows in the model indicate the direction of influence and support, emphasising a systematic and collaborative approach to national defence.

Case Study: The similarities and differences between Singapore's Total Defence and Malaysia's concept of HANRUH

As per Zuber's observations in 2021, it is prudent to exercise caution when drawing comparisons between Singapore's Total Defence and Malaysia's HANRUH, primarily due to the conspicuous disparities evident in factors such as the annual defence budget and the divergent national priorities of each country.

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Singapore places paramount emphasis on defence and survivability, while Malaysia's central focus revolves around national unity and economic development. Consequently, a more appropriate and instructive comparative framework would entail benchmarking Singapore's Total Defence against analogous concepts in Nordic countries, particularly those in Europe, such as Sweden or Switzerland. This rationale stems from the Singaporean Total Defence concept and draws inspiration from the models and principles espoused by these European nations.

Among the salient factors that inherently engender stark differences in any comparative assessment between Singapore and Malaysia are the significant distinctions in geographical size and population demographics. These intrinsic distinctions underpin the essence of this essay, which refrains from undertaking a direct comparative analysis of the achievements in the implementation of Singapore's Total Defence and Malaysia's HANRUH. Nonetheless, it is imperative to underscore that several facets of both countries' Total Defence concepts exhibit noteworthy parallels and disparities, each grounded in their respective rationales for implementation and adoption. These facets warrant comprehensive examination and analysis, shedding light on Southeast Asia's multifaceted landscape of national defence strategies. The apparent similarity is the background or history of both countries, which the British had colonised for almost five decades before they gained their independence in the mid-20th century. Furthermore, Singapore and Malaysia also experienced the Japanese invasion during WWII until the war ended in 1945.

Figure 3: Similarity of 5 Pillars of Total Defence of Malaysia and Singapore

Based on the experience of being colonised and invaded in the past, the global security instability due to the status quo of the Cold War and the emergence of communism and capitalism ideology, which took place during the Indo-China War, has caused the Singaporean and the Malaysian governments to embark into the additional defence strategy namely total defence concept in the mid-1980s (Hoa and Turner, 2010). Hence, both countries' historical baggage, similar threats and security environment are the main contributing factors to adopting and implementing the total defence concept. Another apparent similarity is the geographical location that makes both countries share the maritime environment, giving them a similar axis of threats and vulnerabilities.

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With regards to geo-location, even though both countries are blessed to be situated far away from the earth's cruel disaster belt and not directly experience natural disasters such as volcanic eruptions, earthquakes, and typhoons, both countries still face other disasters such as flooding and landslides, happening commonly after heavy rain downpour during the Northeast monsoon period. Thus, implementing the total defence concept should prepare the country to face the necessary circumstances. Figure 3 elucidates the foundational framework underpinning the Total Defence strategy employed by Malaysia and Singapore, delineating five pivotal pillars: Military, Civil, Economic, Social, and Psychological Defence. While the structure of this framework is shared, the specific application within each nation is tailored to address distinct threats and leverage unique strengths. Singapore's Total Defence strategy is shaped by its experiences with non-conventional threats, such as terrorism and racial tensions. It drives a comprehensive preparedness program to preclude such occurrences and strengthen national resilience.

Ismail (2012) notes that this approach aims to prevent unrest and fortify economic and defence mechanisms. In contrast, Malaysia's implementation of the HANRUH concept evolved in response to the palpable threat posed by the Communist Party of Malaya (CPM), necessitating a state of emergency and a strategic defence posture tailored to this historical context. This divergence is further underscored by the public's engagement with each country's defence initiatives. Singapore's conscription policy through its National Service program has engendered widespread public support and understanding of its Total Defence framework. Malaysia, however, does not employ a mandatory service model, which has led to less public familiarity with HANRUH despite its emphasis on comprehensive national involvement in defence and peacekeeping. These differences notwithstanding, both countries' fundamental tenets of Total Defence are designed to create a robust defence posture. Military Defence is the bulwark against external threats, whereas Civil Defence ensures preparedness for internal emergencies.

Economic Defence is recognised as the bedrock for sustaining national security, while Social Defence fosters unity and societal resilience. Lastly, Psychological Defence seeks to bolster national spirit and resolve in the face of adversity. Though similar in its composite structure, this strategic framework is nuanced by each country's distinctive strategic needs and public involvement levels. It encapsulates the belief that national strength transcends military might and extends into the socio-economic and psychological domains, ensuring a united front against a broad spectrum of potential challenges to sovereignty and national well-being.

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The Integral Role of Science, Technology, and Innovation in Malaysia's Multi-Dimensional Defence Strategy

Integrating Science, Technology, and Innovation enhances Malaysia's military defence strategy. This encompasses deploying advanced weaponry systems, sophisticated communication networks, and robust surveillance technologies that collectively augment the operational capabilities of the armed forces. Equally critical is the application of STI in cybersecurity, which protects vital national information infrastructure against cyber threats. These efforts are crystallised in initiatives such as the National Defence Industry Policy and the formation of the Malaysia Defence Industry Council, reflecting a commitment to a technologically superior defence posture (Ministry of Defence Malaysia, 2023).

Civil defence stands to benefit substantially from STI, particularly in the realms of infrastructure resilience and emergency response. Innovations in structural design enable critical facilities to endure catastrophic events, while technological advancements in early warning systems and communication networks enhance the efficiency of disaster management. Malaysia's National Disaster Management Agency (NADMA) exemplifies this by establishing the National Disaster Data Centre, positioning technology at the forefront of disaster preparedness and management (National Disaster Management Agency Malaysia, 2020).

Malaysia's economic defence, on the other hand, is inextricably tied to the proliferation of STI, which catalyses research and industrial diversification, thereby buttressing the nation against economic adversities. The strategic focus on green technology, as outlined in the Green Technology Master Plan, epitomises the nation's vision for an economy resiliently grounded in sustainable innovation (Ministry of Environment and Water Malaysia, 2019). STI markedly reinforces social defence through enhancements in healthcare delivery and educational quality. Telemedicine initiatives and the MySejahtera contact tracing app are emblematic of Malaysia's response to health crises, underscoring the role of technology in public health management (Ministry of Health Malaysia, 2021).

In the education sector, the Malaysia Education Blueprint 2015-2025 highlights the commitment to leveraging STI for pedagogical advancement, thus preparing a knowledgeable and adaptable population (Ministry of Education Malaysia, 2015). In the psychological domain, STI underpins the nation's readiness and mental resilience. Accessible and advanced healthcare services, facilitated by technological innovations, reinforce public trust and contribute to the collective psychological fortitude. Furthermore, the intersection of STI with educational initiatives ensures the development of a populace that is not only academically proficient but also equipped to handle the psychological demands of crises.

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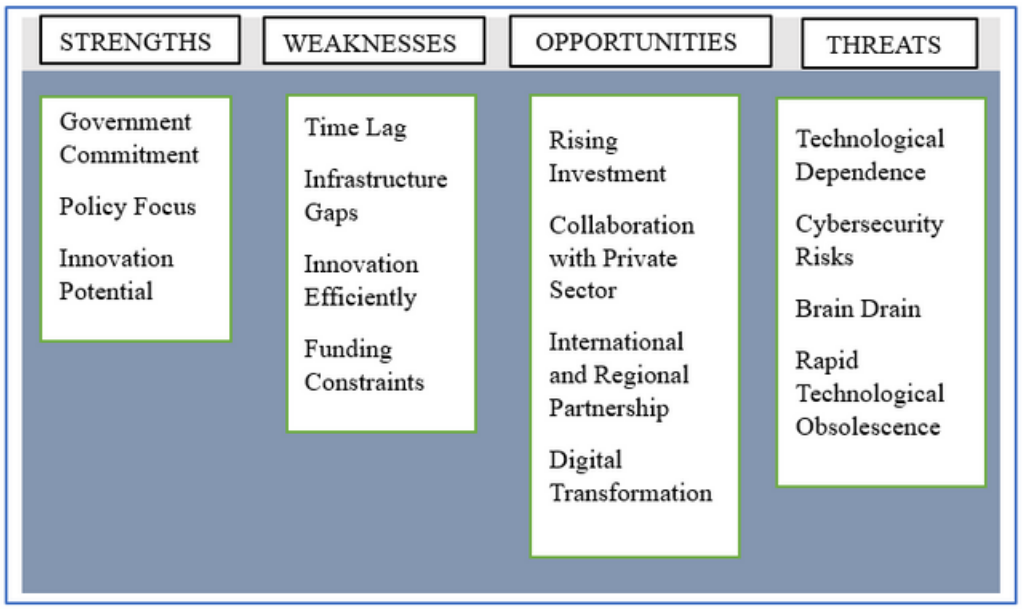
Science, Technology, and Innovation applications across the defence spectrum underscore their pivotal role in safeguarding national security. The strategic implementation of STI is paramount for maintaining and enhancing Malaysia's defensive capabilities, economic robustness, social stability, and psychological resilience, thus ensuring the nation's continued prosperity and security.

SWOT Analysis of Malaysia's Science, Technology, and Innovation in Total Defence for People's Security

The SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the current state of STI in Malaysia, specifically concerning the implementation of Total Defence and its impact on people's security, is illustrated in Figure 4. It visually represents the SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, further elaborated in the following paragraphs.

Figure 4: SWOT Analysis



The SWOT analysis in Figure 4 is focused on the strategic positioning of Science, Technology, and Innovation (STI) within a governmental context, referring to Malaysia based on the National Policy on Science, Technology, and Innovation 2021-2030. It assesses the strengths, weaknesses, opportunities, and threats related to the implementation and development of STI. The strengths highlight the Malaysian government's commitment to STI, a clear policy focus, and the country's potential for innovation.

However, the weaknesses point out the challenges, including delays in policy implementation (time lag), gaps in infrastructure, inefficiencies in the innovation process, and financial constraints. The opportunities identify areas for growth, such as increased investment, potential collaboration with the private sector, regional and international partnerships, and ongoing digital transformation. The threats recognise risks like becoming overly reliant on technology (technological dependence), cybersecurity vulnerabilities, loss of skilled professionals (brain drain), and the possibility of current technology quickly becoming outdated (rapid technological obsolescence).

In the landscape of Malaysian national security, the potency of Science, Technology, and Innovation (STI) stands as a salient pillar, undergirded by a robust government commitment outlined in the National Policy on Science, Technology, and Innovation 2021-2030. As Krishnan et al. (2022) examined, this strategic framework engenders a conducive environment for STI growth, particularly emphasising its role as a crucial lever in surmounting national and security challenges. This policy-driven environment ensures directed investment in STI, aiming for substantial societal and security dividends. Malaysia's wealth of adept researchers and innovators furnishes the nation with an arsenal of expertise poised to propel indigenous technological solutions adept at addressing emergent security issues, thereby elevating national defence capabilities.

Notwithstanding these strengths, Malaysia's STI sector confronts several internal challenges that bear on implementing its Total Defence doctrine, notably a discernible delay in the transition from policy formulation to operationalisation, a legacy of the nation's unmet Vision 2020 objectives. These challenges necessitate the formation of resilient strategies and dynamic funding models attuned to the rapid pace of technological change. Despite significant infrastructural advancements, persistent gaps, particularly in remote areas, foster a technological divide that could curtail the broad-based deployment of STI solutions and potentially compromise the commitment to Total Defence and HANRUH.

The efficiency of innovation processes and the sufficiency of funding are further areas of concern that could potentially stymie the full realisation of STI's potential in strengthening national security. However, the reinvigoration of interest in STI since 2020, marked by new policies, portends a surge in research and development funding, setting the stage for accelerated technological innovation.

Integrating the private sector into STI projects could catalyse the development of practical and scalable security solutions. At the same time, Malaysia's strategic positioning and diplomatic ties are well-suited for regional STI collaborations that enhance collective security and innovation.

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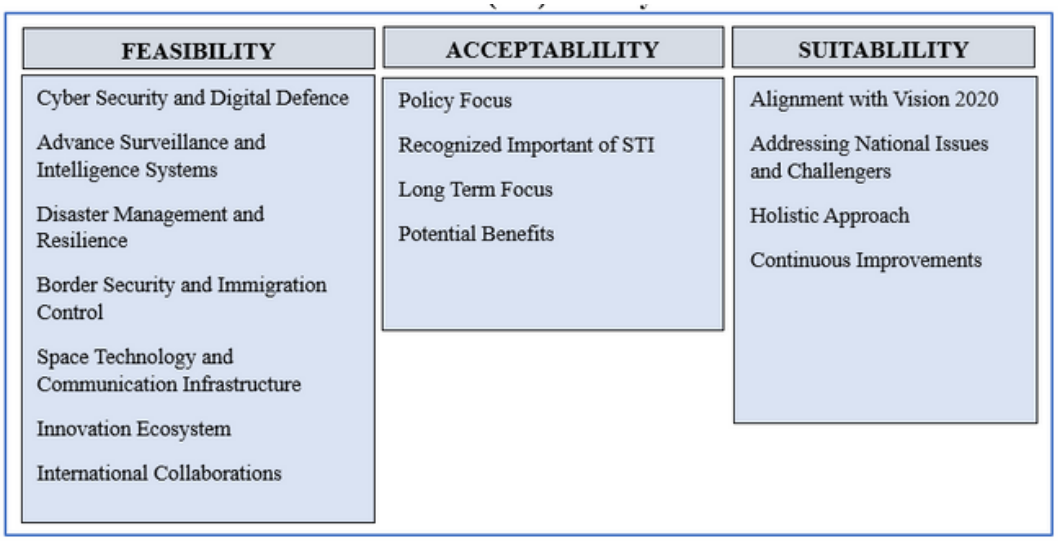
Conversely, the threats confronting Malaysia's STI trajectory are manifold. A dependency on external technological sources could engender national security vulnerabilities, while an ever-expanding cyber threat landscape necessitates fortified cybersecurity measures. The brain drain phenomenon could deplete Malaysia's innovative capacities, and the brisk pace of technological evolution mandates continual updates to maintain the relevance of STI in security solutions.

These elements underscore the need for a vigilant and adaptive approach to integrating STI within the nation's security apparatus, underpinning the strength and effectiveness of Malaysia's Total Defence strategy in the face of evolving global challenges. Strategies marked as feasible, acceptable, and suitable have been identified for the implementation of STI policies aimed at enhancing Total Defence in Malaysia, as elucidated in Figure 5, which portrays the core discourse on the adoption and acceptance of STIs to fortify the effectiveness of Total Defence within the Malaysian context.

Figure 5: Feasibility, Acceptability and Suitability in Implementing Science, Technology, and Innovation (STI) in Malaysia



The framework in Figure 5 encapsulates the Malaysian government's multifaceted approach towards leveraging Science, Technology, and Innovation (STI) for national defence, as detailed in the National Policy on Science, Technology, and Innovation 2021-2030. This policy is a testament to the government's commitment to STI as an integral component of national security strategy. Malaysia boasts a wealth of skilled IT professionals and a thriving technology industry, providing a robust foundation for strengthening cybersecurity capabilities.

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However, to effectively combat the ever-evolving landscape of cyber threats, it is imperative to maintain continuous investment in research, development, and training. Collaborating with private enterprises and international cybersecurity experts can further enhance the feasibility of this strategy. Malaysia's ability to safeguard its digital landscape is crucial for national security and protecting individuals' sensitive information and critical infrastructure from potential cyberattacks.

Furthermore, Malaysia is well-positioned to develop advanced surveillance systems, incorporating cutting-edge technologies like drones, sensors, and data analytics. This leverage comes from the country's well-established defence and intelligence infrastructure. Nevertheless, ongoing investments are paramount to modernising and maintaining these systems, ensuring their effectiveness in addressing emerging security challenges. This investment is vital not only for defence purposes but also for broader security and disaster management applications.

Robust research collaboration with international partners and investments is imperative to enhance feasibility. Fostering collaboration between the STI ministry and other security agencies is crucial for a comprehensive safety approach. Malaysia's experiences in managing natural disasters and its well-established disaster management framework make it feasible to incorporate STI solutions, such as early warning systems, remote sensing, and data analytics, into existing disaster management practices, thus enhancing overall resilience and disaster preparedness.

On a different note, Malaysia's established border control and immigration systems position it favourably for implementing advanced technologies like biometric identification and facial recognition with suitable investments. Collaboration with countries experienced in border security technologies can further enhance feasibility, with a particular emphasis on its importance during evacuation operations, both domestically and abroad.

Additionally, Malaysia has shown progress in space technology with the development of its satellites. Further investment and collaboration with space agencies and international partners can enhance space technology capabilities and communication infrastructure, opening up opportunities for space-related STI initiatives. Malaysia's existing universities, research institutions, and industries engaged in research and innovation provide a strong foundation for a thriving innovation ecosystem. Strengthening this ecosystem requires policy support, funding mechanisms, and industry-academia collaboration to nurture startups and support Research and Development (R&D) projects, driving innovation in various sectors.

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Furthermore, Malaysia's favourable position for international collaboration, facilitated by diplomatic relations and participation in global networks, makes engaging in joint research projects and technology transfer initiatives feasible with advanced countries. This collaboration can yield significant benefits for the nation, not only in terms of technological advancements but also in strengthening diplomatic ties and knowledge exchange on a global scale.

The alignment of these strategies with the National Policy on Science, Technology & Innovation 2021-2030 signifies a shared vision between the government and relevant stakeholders, reflecting a commitment to enhancing Total Defence in Malaysia. These strategies are feasible, acceptable, and suitable for implementing STI policies. They seamlessly integrate with Malaysia's defence policy and national strategic interests, emphasising self-reliance, partnerships, and comprehensive defence, as emphasised by Karminder Singh Dhillion (2019). By leveraging STIs, Malaysia can significantly bolster its defence capabilities, safeguarding national security.

Moreover, STIs have gained widespread recognition as a national development and security cornerstone, earning acceptance among policymakers, researchers, industries, and the general public. Acknowledging the pivotal role of STI policies in enhancing Total Defence reinforces their importance in defence strategies, resource allocation, and narrative development. This recognition further underscores the necessity of adopting the Whole-of-Government and Whole-of-Society (WoGoS) approach, emphasising the allocation of resources and establishing structures that facilitate a comprehensive defence mobilisation plan.

Furthermore, the long-term perspective provided by the 12th Malaysia Plan and Vision 2020 extended to 2030 underscores the acceptance of these strategies as integral components of a sustainned national development agenda. Malaysia's Defence White Paper serves as a comprehensive and long-term blueprint aimed at coherently enhancing the country's overall defence capability. It articulates actionable strategies derived from national elements, reinforcing the commitment to these long-term objectives.

Additionally, these strategies offer potential benefits that extend beyond security concerns, making them more appealing to a diverse range of stakeholders. Implementing STI policies can foster self-reliance by nurturing indigenous defence capabilities, reducing dependence on foreign technologies, and enhancing overall defence readiness. Simultaneously, STI policies can stimulate economic growth by promoting the development of local industries and generating job opportunities, thereby contributing to the nation's socio-economic advancement. These policies can facilitate partnerships and collaboration with other countries and international organisations, promoting knowledge exchange and cooperation within the defence sector and strengthening Malaysia's position in the global arena.

Despite missing the original Vision 2020 deadline, these strategies remain well-suited for Malaysia's goals because they align with the vision's long-term objectives. Resetting the target to 2030 provides a more realistic time frame, allowing for implementing strategies to achieve the desired outcomes.

Strategic Implications of STI in Malaysia's Defence Framework

This alignment with Vision 2020 underscores the recognition of the importance of STI policies in strengthening total defence in Malaysia. Notably, incorporating STI policies into various national defence documents, including the Defence White Paper, Defence Offsets Policy, Total Defence Concept, and National Defence Strategy, highlights their suitability in bolstering defence capabilities and addressing emerging security challenges. The focus of these strategies on making STI an enabler to address national issues and challenges aligns perfectly with Malaysia's current needs, especially in national security. STI policies offer a versatile toolset that can effectively tackle various issues and challenges, making them consistent with Malaysia's defence policy and national strategic interests, which underscore the significance of self-reliance, partnerships, and comprehensive defence.

Adopting a holistic approach highlights the importance of STI policies as an integral part of Total Defence. This approach ensures that defence strategies and policies encompass all relevant aspects, including technological advancements, innovation, and collaboration with various stakeholders. The 12th Malaysia Plan's holistic approach to mobilising STI further emphasises the suitability of these strategies in addressing a wide array of socio-economic and security issues. Lastly, the emphasis on continuous improvement is paramount in implementing STI policies to enhance the effectiveness of Total Defence in Malaysia.

The comprehensive nature of these strategies allows for constant adaptation and progress in response to changing circumstances, rendering them well-suited for sustained growth and development. The Malaysian government's unwavering dedication to Science, Technology, and Innovation (STI), articulated in the National Policy on Science, Technology, and Innovation 2021-2030, provides a clear direction for STI development, signifying its pivotal role in national defence. This commitment, noted by Krishnan et al. (2022), has cultivated a conducive environment for investment and research, positioning STI as a critical instrument for national progress and security. The strategic focus on STIs underscores its potential to enhance Malaysia's welfare and safety, driving the allocation of resources to exploit STIs for greater societal benefits.

Malaysia's pool of talented scientists and innovators catalyses ground-breaking innovations, aligning with the nation's objectives to fortify its defence capabilities through indigenous technological solutions.

However, the execution of STI initiatives within Malaysia's Total Defence framework, known as HANRUH, encounters inherent challenges. These include a historical delay in policy execution, as demonstrated by the shortfall in achieving the Vision 2020 targets, and infrastructural disparities that hinder equitable technology access. Addressing these challenges is imperative for seamlessly integrating STI policies into the national defence strategy. Furthermore, innovation inefficiencies and funding limitations must be resolved to unlock the full potential of STI in reinforcing national security. Opportunities arising from renewed interest in STI post-2020 and the introduction of new policies are manifold. They portend an uptick in R&D funding and investment, fostering innovation and technological growth to bolster HANRUH.

Private sector engagement could accelerate innovation, enriching security solutions with industry expertise. Malaysia's geographical and diplomatic positioning facilitates regional and international partnerships, enhancing collective security measures and encouraging innovation. The digital transformation journey offers avenues to integrate cutting-edge technologies into the security sector, augmenting Total Defence capabilities. Conversely, threats to Malaysia's STI progress include a dependency on imported technologies, which could compromise data security and sovereignty. The cyber threat landscape presents risks to critical infrastructure and personal data security, with the brain drain phenomenon potentially depleting the country's innovative capabilities.

Moreover, rapid technological changes necessitate continuous updates to maintain the relevance of STI in security solutions. Despite these challenges, the alignment with the long-term goals of Vision 2020—extended to 2030—illustrates the enduring suitability of these STI strategies. Their incorporation into national defence documents affirms their role in enhancing defence measures and meeting contemporary security needs. The holistic approach of the 12th Malaysia Plan showcases the comprehensive mobilisation of STI across socio-economic and security spheres, with a commitment to ongoing adaptation and improvement to ensure resilience and sustained development in Malaysia's defence strategy.

Recommendations and Way Forward

The most significant challenge at the national level lies in achieving a seamless integration and comprehensive understanding of HANRUH among various stakeholders and partners. It is imperative that everyone involved comprehends their roles and responsibilities in striving towards the objectives. To facilitate this, all ministries and agencies must be open to sharing data and collaborating harmoniously under the National Security Council's (NSC) guidance.

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This coordinated effort can catalyse the Ministry of Science, Technology, and Innovation (STI) to identify critical areas requiring technological enhancements and develop targeted innovations that benefit the NSC and the nation. Bolstering Total Defence through STI in Malaysia is a multifaceted endeavour that demands a holistic and collaborative approach. To navigate this complex landscape effectively, several recommendations and a forward-looking strategy have been outlined in Table 1, which provides a clear roadmap for improving understanding and coordination among all stakeholders.

Table 1: Recommendations and Way Forward

Serial	Recommendations	Way Forward
1.	Cyber Security and Digital Defence	Develop a robust national cyber security strategy to address cyber threats and build digital resilience, promoting collaboration between government, academia, and industry.
2.	Advance Surveillance and Intelligence Systems	Enhance data analytics capabilities to process and interpret large volumes of data for early warning and threat assessment.
3.	Strategic Defence Technologies	Encourage collaboration between defence industries and academic institutions to drive innovation in military technologies.
4.	Energy Security and Sustainability	Develop smart grid systems to optimise energy distribution and consumption.
5.	International Collaboration	Engage in knowledge sharing and collaborative research with regional and global partners to enhance defence capabilities.
6.	Public Awareness and Communication	Leverage social media, interactive platforms, and virtual simulations to engage citizens in understanding their roles and responsibilities.
7.	Policy and Regulation	Establish a dedicated agency or task force to oversee STI initiatives for Total Defence.
8.	Continued Research and Adaptation	Maintain a continuous research, development, and adaptation cycle to stay ahead of evolving security challenges.

Table 1 outlines a strategic plan for enhancing Malaysia's national security through Science, Technology, and Innovation (STI). It recommends developing a comprehensive cyber security strategy, improving surveillance and data analytics, fostering innovation in defence technology through academia-industry partnerships, and advancing energy security. The table also suggests increasing international collaboration for shared knowledge and defence capability enhancement, boosting public engagement through digital platforms, and creating a specialised agency to oversee STI in Total Defence. Additionally, it emphasises the need for ongoing research and adaptation to address emerging security threats effectively.

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Malaysia should prioritise investments in cutting-edge cyber security technologies and expertise to protect critical infrastructure, government systems, and private sector entities. Developing a robust national cybersecurity strategy is crucial for addressing cyber threats and enhancing digital resilience. Collaboration between government, academia, and industry is critical to achieving this. Furthermore, the nation should encourage research in emerging areas such as blockchain, AI-driven threat detection, and secure communication technology to stay ahead of evolving threats. In addition to cyber security, Malaysia must focus on developing and deploying advanced surveillance technologies. These technologies are vital for border control, maritime security, and airspace monitoring systems. Improving data analytics capabilities to process and interpret large volumes of data for early warning and threat assessment is essential.

Moreover, investing in research and development of AI-powered predictive modelling can help anticipate security challenges and trends, enhancing overall security measures. Malaysia should strengthen its indigenous defence manufacturing capabilities to reduce reliance on foreign suppliers. This can be achieved through collaboration between defence industries and academic institutions, fostering innovation in military technologies. Emphasis should be placed on developing technologies like drones, unmanned vehicles, and autonomous systems for surveillance and tactical applications. Investing in biotechnology research in public health is critical for developing vaccines, treatments, and diagnostic tools, particularly for emerging infectious diseases. Strengthening medical and public health capabilities to respond effectively to biological threats is paramount. Collaboration with international partners in healthcare innovation can accelerate progress in this area.

For energy security and sustainability, Malaysia should promote research and development of renewable energy technologies to reduce dependence on fossil fuels. Investment in energy storage solutions for critical infrastructure resilience during emergencies is essential. Developing smart grid systems can optimise energy distribution and consumption, contributing to long-term sustainability. International collaboration is also a valuable avenue for enhancing defence capabilities. Engaging in knowledge sharing and collaborative research with regional and global partners can lead to significant advancements. Participation in joint military exercises, technology development projects, and information exchange is vital. Leveraging international expertise can accelerate STI advancements in support of Total Defence. Public awareness and communication are crucial components of Total Defence.

Leveraging STI to improve communication and public awareness campaigns about national security and Total Defence concepts is essential. Social media, interactive platforms, and virtual simulations can engage citizens and enhance their understanding of their roles and responsibilities in contributing to Total Defence.

Therefore, effective governance of STI initiatives is crucial. Establishing a dedicated agency or task force to oversee these initiatives, ensuring coordination and alignment with national security objectives, is recommended. Furthermore, clear policies and regulations should be developed to govern the ethical use of emerging technologies, such as AI and biotechnology, in defence and security applications.

Lastly, a continuous research, development, and adaptation cycle is necessary to stay ahead of evolving security challenges. Regularly assessing the effectiveness of STI initiatives and making necessary adjustments based on lessons learned and emerging threats through a series of exercises is imperative. By implementing these comprehensive strategies and recommendations, Malaysia can leverage the power of Science, Technology, and Innovation to strengthen HANRUH and enhance the country's security and resilience in the face of a rapidly changing and complex global landscape.

Conclusion

Malaysia possesses several vital strengths that position it well for leveraging STI to strengthen Total Defence and enhance national security. The government's commitment, policy focus, innovation potential, coordination efforts, and potential for regional collaboration are significant initiative assets. However, it is vital to fully address weaknesses such as time lag, infrastructure gaps, innovation efficiency, and funding constraints to harness STI's potential. Seizing opportunities through increased investment, collaboration, international partnerships, and digital transformation is essential. Simultaneously, vigilance is necessary to mitigate technological dependence, cyber security risks, brain drain, and technological obsolescence threats. Strategic planning and effective implementation will be critical to maximise the benefits of STI for the nation's security and progress.

The strategies identified for implementing STI policies to enhance Total Defence in Malaysia are feasible and acceptable. Malaysia's existing infrastructure, skilled workforce, and policy alignment support the feasibility of these strategies. Additionally, accepting STIs as a crucial driver of development and security and recognising them in national policies ensures that the strategies have broad acceptability among various stakeholders.

Moreover, these strategies are suitable for addressing national issues and challenges, as evidenced by their alignment with Vision 2020, the 12th Malaysia Plan, and their focus on making STI an enabler for national development. Their holistic nature allows for continuous improvement and adaptation to changing circumstances, making them suitable for long-term development and enhancing national security through Total Defence. Sustained commitment, investment, and collaboration is vital for successful implementation.

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STI is essential to strengthening Total Defence and enhancing national security in Malaysia. The identified strategies, encompassing cyber security, advanced surveillance, biotechnology, and disaster management, are feasible given Malaysia's skilled workforce and existing infrastructure. Their acceptability is evident in policy alignment and recognising the importance of STIs, with a long-term focus on national development.

Additionally, the strategies' suitability is reinforced by resetting the target to 2030, allowing a realistic time frame for achieving desired outcomes, adopting a holistic approach, and facilitating continuous improvement. Malaysia can create an innovation ecosystem that fosters scientific curiosity and technological advancement by capitalising on strengths such as government commitment and policy focus while addressing weaknesses such as innovation inefficiencies and funding constraints. The opportunity for increased investment, collaboration, and international partnerships positions Malaysia to harness STI's potential to enhance national security, address challenges, and advance its development goals.

In this pursuit, Malaysia can become a trailblazing nation, leveraging the transformative power of STI to secure its borders, fortify its infrastructure, and safeguard its citizens' well-being. Through strategic implementation, Malaysia's Total Defence will be fortified by cutting-edge technologies, pioneering research, and an engaged populace, ensuring the nation's prosperous and secure future. Inclusive planning is essential for building more robust innovation systems involving co-design by innovators and users from diverse backgrounds.

Expanding and deepening the participation of science communities, funders, academia, and the private sector is crucial. STI serves as the linchpin in bolstering Total Defence in Malaysia. By integrating STI into military, economic, social, psychological, and civil defence components, Malaysia can enhance its security, resilience, and preparedness to face multifaceted challenges and threats. Fostering STI should remain central in the nation's strategic planning, reinforcing Malaysia's commitment to safeguarding its future and prosperity. As Malaysia continues to invest in STI, it positions itself as a forward-looking and resilient nation capable of meeting the evolving demands of the modern world.

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Colonel Jagjit Singh a/l Indar Singh

Colonel Jagjit Singh was born on April 17, 1967, in Batu Arang, Selangor. Joined the Malaysian Armed Forces on 1st Oct 1985 and was commissioned to the 2nd Royal Ranger Regiment. Throughout his career, Colonel Jagjit Singh was given the opportunity to hold various key appointments, the notable ones Directing Staff at Army School of Management, Train the Trainer at Malaysian Army Wargame Centre, Operational and Training Staff Officer at 4th Division Headquarters, Staff Officer for Bilateral and Multilateral Exercise at Army Field Command Headquarters, Deputy Commander of Regiment 510 Territorial Army, Logistics Staff Officer at 4th Division Headquarters, Chief of Staff at 7th Infantry Brigade Headquarters and prior attending National Resilience College he was the Chief of Staff at Army Training and Doctrine Command Headquarters.

On academic qualification, Colonel Jagjit Singh graduated with Distinction from Malaysia Armed Forces Defence College with a Master of Social Science (Defence Studies) in 2018 and graduated from University Malaya with a Master in Management in 2005. He holds a Diploma in Psychology (Counselling) from the National University of Malaysia, a Diploma in Strategic and Defence Studies from the University of Malaya and an Advance Diploma in Business and Management from the University of Wales, United Kingdom.

Colonel Jagjit Singh has also earned personal and service awards for his outstanding achievements. He is married to Madam Kiranjeet Kaur and blessed with two sons.

The Statesman Journal
2023, Vol 1 48 - 66
ISSN-2811-454x

MALAYSIA'S ENERGY SECURITY: EXPLORING THE NUCLEAR OPTION

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Abstract

Over the years, it has been realised that non-renewable energy sources such as fossil fuels have tremendously depleted over the last decades. With its global future increasing demand, critical points of its depletion have been pondered globally on its consumption effectiveness. Governments worldwide, including Malaysia, have taken multiple approaches to combat its adverse effects, including reducing the emission of dangerous greenhouse gases. As one of its national efforts, in September 2023, the Malaysian government proactively crafted the National Energy Transition Roadmap (NETR) as a part of the National Energy Policy 2022-2040 (DTN) to expedite and make Malaysia's energy transition provision by actively joining the global effort. Taking into consideration its five fuel policies aiming at bringing 5% of total energy capacity from renewable sources by 2005, the revised version of achieving 31% of renewable energy by 2025 is also challenging as the capacity remains at only 23% and also fails. Thus, Malaysia should seriously consider an energy mix such as nuclear. This study will focus on three main issues of Malaysia's options on exploring nuclear as an essential energy resource to ensure stable social and economic development, its viability and impact or challenges incorporating as energy mixes before underlining some recommendations to be considered in Malaysia's transition to the renewable energy mix. The paper also suggested some critical segments that decision-makers should consider, such as policy inclination revamp due to options availability and cleanliness, which will further diversify Malaysia's energy mix to meet its demand most efficiently. In fortifying the effort, it is also suggested that the relaxation of regulation of the market's package assists in achieving holistic environmental goals in Malaysia through sandbox regulations. Addressing public perceptions is also essential for controlling extremism, misinformation, and narratives about the apocalypse.

Keywords: *Energy Security, Energy Resources, Malaysia Nuclear Energy Transition*

"Unless we act now, the 2030 Agenda will become an epitaph for a world that might have been."

- António Guterres, Sec Gen, UN

Introduction

Imagine greater Kuala Lumpur without any electrical supply; vehicles on the road standstill due to relying heavily on totally depleted non-renewable energy such as coal and fossil fuel. It is only possible to realise how to preserve these kinds of resources in the context of energy securitisation in the long run. According to a holistic study conducted by Ang et al. (2015), the definition of energy security highly depends on the context of an individual country's unique circumstances.

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Over 104 energy security studies were scrutinised and analysed, and energy definition overall revolves around energy sustainability or availability to a nation, with adequate infrastructure preserving it. At the same time, it also had some influence on maintaining price fluctuation that undermined the societal effects of a country. In addition, it also has a significant environmental impact on its overall energy consumption, which can be reduced by good governance and continuous increases in consumption efficiency.

The International Energy Agency (IEA) listed that the primary energy supply consists of bio-fuel, natural gases, nuclear energy, hydro generated, coal, geothermal, solar and, last but not least, waste (Awang, Ahmad, & Rabiul, 2020). In Malaysia's ecosystem, the Ministry of Natural Resources, Environment and Climate Change (NRECC) is the sole agency responsible for administering national energies. Under the National Energy Policy (NEP) 1979, Malaysia launched five fuel policies to bring 5% of total energy capacity from renewable sources by 2005. Moreover, those policies up to 2015 had failed drastically (Kardooni, Yusoff, & Kari, 2015). A revised target of achieving 31% renewable energy by 2025 is also challenging as the capacity remains only 23% (MIDA, 2021). According to the new National Energy Policy (NEP) 2022, Malaysia mainly focused on expanding limited renewable resources such as bioenergy, solar energy, and hydropower generated to maintain and stabilise its societal and economic stability, which has positive and adverse effects.

However, referring to the resources mentioned in NEP 2022, these renewable resources are less efficient than nuclear energy. The primary energy source in Malaysia is still fossil fuels, which are mainly used in generating electricity as the reservation of this type of energy source is still available but somehow depleting over time. Calculating these resource efficiencies is based on the capacity factor. The capacity factor is expressed as a percentage. It represents the ratio of the actual energy output of a facility or system to its maximum potential energy output if it were operating at total capacity for a specified period. Solar power proved to be the lowest capacity factor out of 24.9% of all primary renewable and non-renewable energy sources, as it is just beginning to be explored further by the government.

For the record, the coal capacity factor is around 50% and nuclear energy, on the other hand, is by far the most reliable, with a capacity factor of 92.5% (Mueller, 2021). Malaysia has explored nuclear power, which is currently a promising option for Malaysia's energy issues and shall be seen as a feasible option and a way forward for energy security. Thus, it raised further questions about whether nuclear is a reliable option for ensuring stable social and economic development in Malaysia, its viability and the identified impact or challenges in incorporating it as an energy mix.

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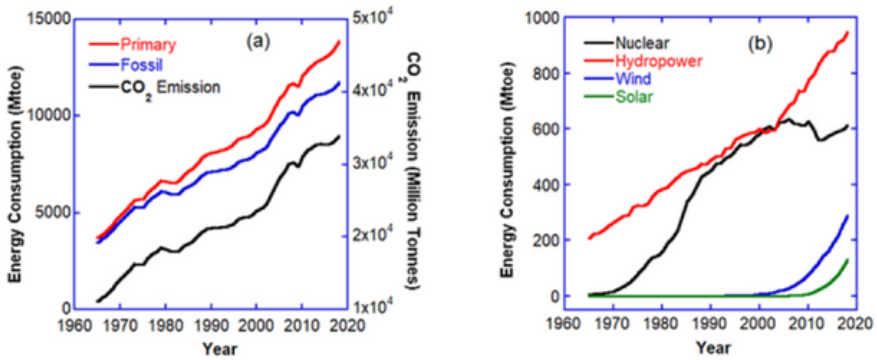
Depleted Resources: Malaysia's Strategic Options in Considering Sustainable Energy

Over the last five decades, the world has experienced substantial development and advancement. Human living standards have risen, improving well-being, health, and life expectancy. Science, technology, and abundant resources, including fossil fuels, have played a crucial role in significantly enhancing human welfare during this period (UNDP, 2000). Realising future energy's continuous and increasing demand, critical points on the depletion of its resources have been debated globally. The fossil fuel consumption trend from 1960 in Figures 1(a) and 1(b), according to Swapan and Bablu (2020), is increasing and is also actively contributing to dangerous CO2 emissions and needs to be crucially and critically reconsidered.

Figure 1: (a) Global Main Energy Consists of Fossil Fuels, Nuclear Energy, Hydroelectric, its Consumption and CO2 Emission (b) Consumption of Nuclear Energy, Hydropower, Wind and Solar



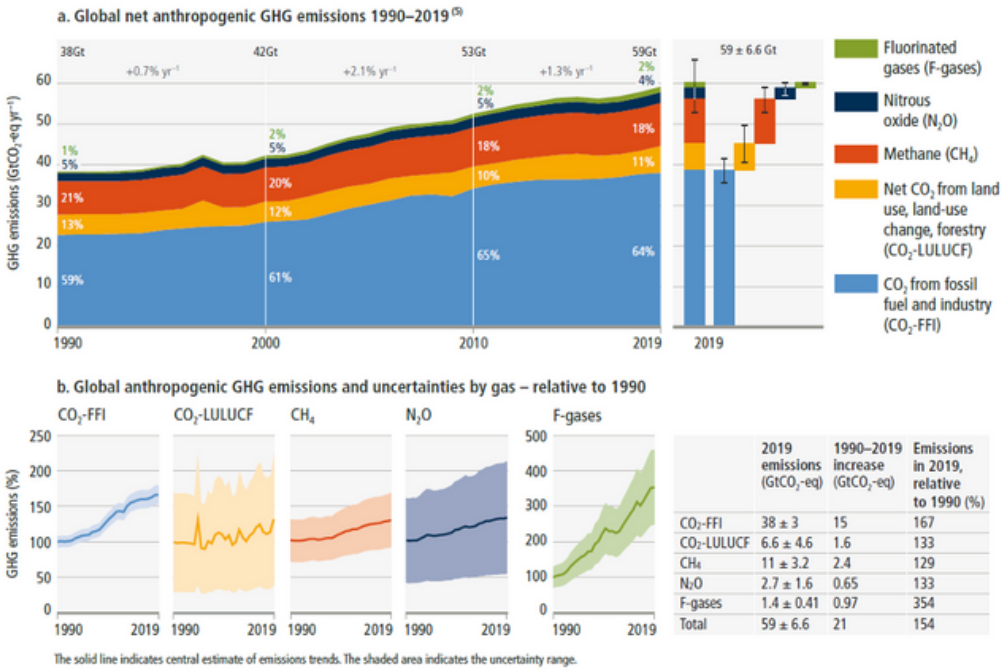
Source: Swapan & Bablu, 2020

In the early 1970s, the concept of energy security primarily focused on minimising reliance on oil consumption and import. That was when it started to be seriously discussed in the Organisation of Co-Operation and Development (OECD), and other oil-importing nations took significant actions. However, oil and other energy market transformations have reshaped this 'initiative'. The number of suppliers, proven reserves, and stocks have grown, while prices have become more flexible and transparent, determined by market dynamics rather than cartel agreements.

The worldwide energy sector is experiencing a swift evolution, focusing on tackling the energy trilemma of ensuring security, affordability and sustainability (EPU-NTER, 2023). Domestically and internationally, there is a kickstart of rising commitment to achieving net-zero Green House Gas (GHG) emissions by further decarbonising energy systems in safeguarding the environment comprehensively due to the tremendous increase in emission of GHG as highlighted by Figure 2.

MALAYSIA'S ENERGY SECURITY: EXPLORING THE NUCLEAR OPTION

Figure 2: Global GHG Emission by Type of Gases 1990 - 2019



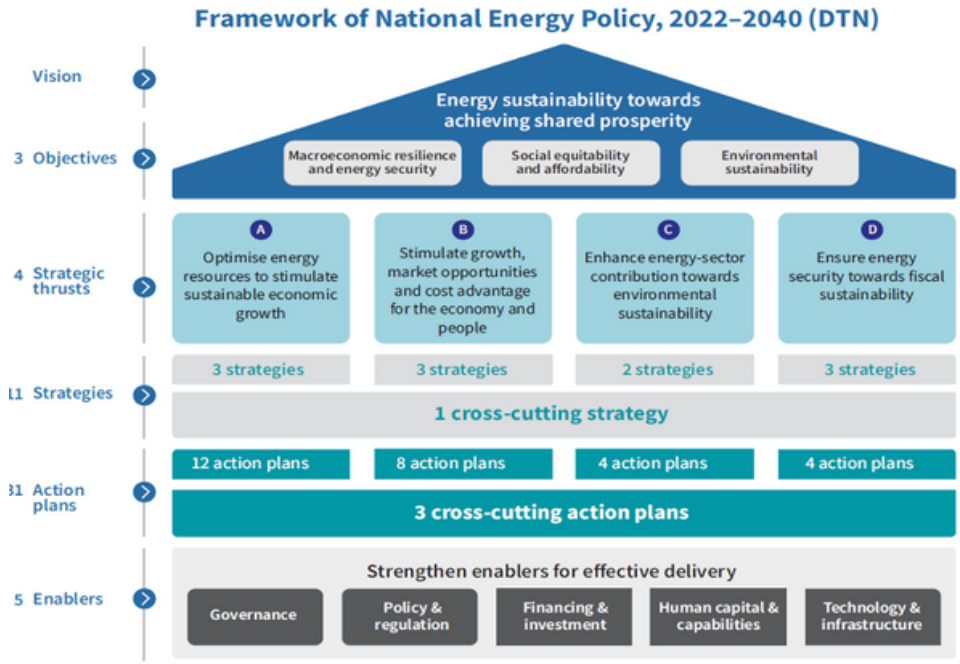
	2019 emissions ($GtCO_2$-eq)	1990–2019 increase ($GtCO_2$-eq)	Emissions in 2019, relative to 1990 (%)
CO_2-FFI	38 ± 3	15	167
CO_2-LULUCF	6.6 ± 4.6	1.6	133
CH_4	11 ± 3.2	2.4	129
N_2O	2.7 ± 1.6	0.65	133
F-gases	1.4 ± 0.41	0.97	354
Total	59 ± 6.6	21	154

Source: Swapan & Bablu, 2020

Reacting to the critical requirement, the Paris Agreement was signed by 196 United Nations (UN) countries and entered into force on 4 November 2016, agreeing to combat climate change by limiting global warming to only 1.5 degrees Celsius (UNFCCC, 2016).In response to this transformative environmentally friendly landscape, the Malaysian government in July and September 2023 had proactively crafted the National Energy Transition Roadmap (NETR) within the National Energy Policy 2022 - 2040 (Dasar Tenaga Nasional - DTN) framework as illustrated in Figure 3 as part of Malaysia's energy transition initiatives.

The NETR plays a pivotal role in helping Malaysia navigate the complexities of a large-scale energy transition, particularly transitioning from a traditional fossil fuel-based economy to a flourishing, high-value green economy considered one of its sustainable options. As an essential record, on 30 September 2019, the government officially closed all nuclear efforts invested from 2009 (Sharvesh, Mohd, & Nasri, 2022) due to its election manifestation. It was initially resuscitated in 2017 when Dato' Sri Hajah Nancy Shukri, as Head of Delegation at the International Ministerial Conference on Nuclear Power in Abu Dhabi, mentioned that Malaysia would utilise nuclear as safe energy, science and technology withstanding unwavering commitment to eliminating nuclear weapons (Shukri, 2017)for a sustainable society and economic benefit.

Figure 3: The DTN Framework of Four Strategic Pillars, 12 Strategies, 31 Action Plans and Five Enablers



Source: EPU-NTER, 2023

Energy Security Issues in Malaysia's Economic Growth and Social Development

"Nuclear power in the overall context will assist in providing the electricity that our ever-growing economy needs that will be achieved without increasing dangerous emissions. This is truly an environmentally responsible source of energy to be considered."

- Michael C. Burgess

Before dwelling on a nuclear-focused perspective, this study will overview the importance of energy in Malaysia's energy ecosystem. Zulkifli (2021) stated that energy security is paramount and pivotal in Malaysia's current and future economic growth and comprehensive social development. As a developing nation with an intensively growing economy and a population that relies heavily on access to reliable and sustainable energy, according to Saleh, Marlia, Christina and May (2021), it must ensure its energy security, which is essential for multiple reasons.

Most importantly, focused initiatives by the government on energy security can guarantee a stable and uninterrupted energy supply, which is vital for sustaining economic activities and driving economic growth. It will enable industries, businesses and infrastructure to function smoothly and promote investment and job creation. A secure and affordable energy supply will also enhance the competitiveness of industries, allowing them to operate efficiently and remain competitive in domestic and global markets (Al-Maleki, 2016). This, in turn, supports economic diversification and export-oriented industries. In addition, energy security supports Malaysia's pursuit of sustainable development by ensuring a continuous and reliable supply of clean and efficient energy.

This will genuinely help Malaysia to balance its economic growth at the current rate of 5% (Zafrul, 2022) with environmental conservation and climate change mitigation with an environmental performance index (EPI) of 47.9% developed based on 40 performance indicators across 11 categories (Wolf et al., 2022), Singapore with 50.9 and Indonesia with 28.2 points.

Other than that, access to affordable and reliable energy is essential for the well-being of the 32.7 million population. It impacts various aspects of daily life, including household comfort, healthcare facilities, education and transportation, thus improving overall social welfare. Daukas and Marinakis (2020) mentioned that a reliable energy supply contributes to poverty alleviation by enabling economic activities and creating job opportunities. It also supports the development of rural areas, where energy access can significantly improve living standards.

Moreover, ensuring energy security and accessibility for all segments of society promotes energy equity, reducing energy availability and affordability disparities. Energy securitisation using clean and renewable sources helps minimise environmental degradation and pollution, contributing to environmental protection and sustainable resource management (Energy.Gov, n.d.). Investing in energy security can also accelerate innovation in clean energy technologies, creating opportunities for research, development and technology transfer.

According to IRENA (2023), diversified and secure energy of non-renewable and renewable energy mix potentially makes Malaysia less susceptible to external energy price fluctuations and supply disruptions, enhancing its resilience in times of global energy market volatility. Ensuring energy security can improve Malaysia's energy-related collaborations and relations with neighbouring countries in South East Asia (SEA) and global energy players, fostering regional and international partnerships.

In summary, in broader terms, energy security plays a critical role in shaping Malaysia's current and future economic and social development. It directly impacts economic stability, industrial growth, social welfare, environmental sustainability and poverty alleviation. By prioritising energy security and adopting a balanced and carefully sustainable energy mix, Malaysia can continue progressing on its development journey while addressing the challenges of energy demand, resource constraints and environmental concerns. Policymakers, businesses, and society shall work together as an entity, such as applying Whole of Government and Whole of Society (WoGoS) to ensure a secure, affordable and sustainable energy future for the nation.

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Fortifying Malaysia's Energy Security: Nuclear as an Option

Malaysia's exploration of the nuclear option for energy security was still a subject of consideration and debate, with the government still needing to decide on implementing a nuclear energy program. Introducing nuclear power in Malaysia has been discussed for several decades, and various studies and assessments have been conducted to evaluate its feasibility and potential benefits. However, the decision has been deferred multiple times for further research, public engagement and safety inspections.

One of the motivations behind considering nuclear energy is to diversify Malaysia's energy mix. Awang et al. (2020) mentioned that Malaysia relies heavily on natural gas and other fossil fuels for electricity generation, making it vulnerable to supply disruptions and price fluctuations in the global energy market. Introducing nuclear power could provide a stable and low-carbon source of electricity to complement existing energy sources (Praharsh & Bryan, 2023). Like many other countries, Malaysia faces the challenge of reducing carbon emissions by 40% from 2005 levels to be achieved by 2020, followed by a further decrease of 45% from 2005 levels by 2030 to combat climate change. Nuclear power plants have the advantage of producing electricity without emitting dangerous gases during operation, making them a potentially attractive option for achieving climate goals while meeting growing energy demands. Extracted from NEP 2022, Malaysia seeks to enhance its energy security and reduce its dependence on imported fossil fuels through renewable energy. Malaysia has the potential to reduce its reliance on external energy sources and enhance energy sovereignty by considering nuclear energy in the current energy mix with the initial investment of twin units of nuclear power plant costing only RM 21.3 billion (Ibrahim, 2014).

The Malaysian government recognises the importance of public engagement in the decision-making process for a comprehensive perspective, including related ministries, agencies and private sectors. Safety concerns related to nuclear energy, particularly in the aftermath of incidents like the Fukushima disaster on 11 March 2011 due to earthquake and tsunami (Britannica, 2011), have prompted thorough safety assessments and engagement with the public to address concerns and build trust (Praharsh & Bryan, 2023). Implementing a nuclear energy program involves significant upfront investments and long payback periods. Careful assessment of nuclear power's economic viability and cost competitiveness compared to other energy sources will help the government decide. Developing and operating nuclear power plants require specialised technological capabilities, and a well-trained workforce has been partially catered through the ASEAN Technical Working Group on Nuclear Power Plant (TWG NPP) established in 2008 with the primary objective of facilitating technological cooperation among members such as Indonesia, Vietnam, Thailand, Malaysia, Philippines, Singapore, Brunei, Laos and Myanmar.

However, Malaysia must continue to evaluate its technical readiness and human resource capacity in handling nuclear technology safely and effectively. In addition, Malaysia has to address the nuclear drawbacks such as nuclear waste. Managing nuclear waste management is a critical aspect of considering nuclear power. The government must have a robust plan for its safe handling, storage and even disposal of harmful radioactive waste, such as the Energy Licensing Board (Board) that oversees Section 3 of the Atomic Energy Licensing Act 1984 (Act 304), enacted on 1 February 1985. In general, exploring the nuclear option for energy security in Malaysia involves a thorough and multifaceted assessment of safety, economic, technical and environmental factors. The government's cautious approach reflects the importance of making a well-informed decision considering the country's energy needs, environmental sustainability and public concerns.

Nuclear Adoption: Balancing Benefits and Challenges

On a serious note, adopting nuclear power as an energy source in Malaysia to replace carbon-based energy (such as fossil fuels) could have benefits and challenges. As with any significant energy policy decision, several benefits and challenges exist in adopting the nuclear options, as extracted in Table 1 below.

Table 1: Balancing Benefits and Challenges of Adopting Nuclear as Malaysia Energy Mix

Long - and Short-Term Benefits	Pertinent Challenges
Low Carbon Emissions: Nuclear power plants produce electricity without emitting harmful greenhouse gases during operation.	**High Capital Costs**: Constructing nuclear power plants requires substantial upfront investment.
Stable Baseload Power: Nuclear power can provide a stable and continuous supply of electricity, no intermittent.	**Long Lead Times**: Building nuclear power plants can take many years, even decades, from planning to entire operation.
Energy Security: Reducing reliance on sole fossil fuels and diversifying the energy mix would reduce vulnerability to international price fluctuations.	**Waste Management**: Nuclear power generates radioactive waste that requires care of its handling, stock storage and dangerous waste disposal.
Long-Term Fuel Availability: Nuclear fuel, such as uranium, is abundant and widely available globally.	**Public Perception and Safety Concerns**: Nuclear power can evoke public safety concerns due to incidents in the past.
Economic Opportunities: Investing in nuclear power infrastructure could stimulate economic growth.	**Regulatory Framework and Expertise**: Establishing a comprehensive regulatory framework and building human resource expertise.

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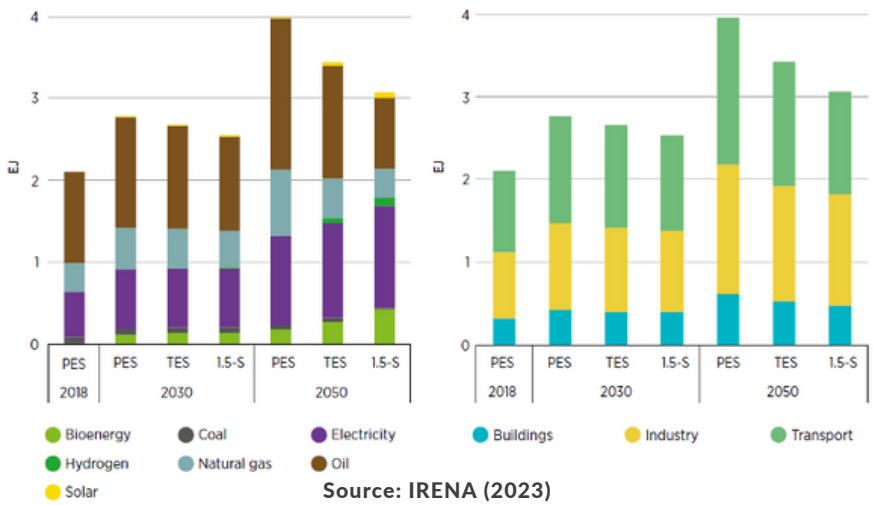
The decision to adopt nuclear power as an energy source in Malaysia involves an all-inclusive relevant party. While nuclear energy offers the potential for low-carbon electricity generation and enhanced energy security (UN, 2021), it also comes with significant economic, safety and environmental considerations. Thorough assessments, public engagement, and comprehensive planning are essential for deciding whether to pursue nuclear power as part of the country's energy mix and transition away from carbon-based energy sources.

Nuclear Viability: Consideration Factors and Comprehensive Evaluation

Assessing the viability of nuclear energy in Malaysia requires a broad perspective and holistic view concerning the country's energy projection need, technological capabilities, economic balance, safety assessment and public opinion. The study will look through each element in detail. According to the Planned Energy Scenario (PES) reported by Malaysia Energy Outlook this year (2023), the outlook outlined the current energy sector plans and standing policies. Malaysia's anticipated energy consumption is set to nearly twofold by 2050, illustrated in Figure 4. This surge is attributed to the rise in urban population and economic expansion, with an estimated annual growth rate of 2.0% in the nation's total energy demand. Compared to limited reserves, Malaysia could soon be predicted to become a net importer of oil and gas.

Figure 4: Malaysia's Energy Consumption Present and Future Estimation in 2018, 2030 and 2050 by Industry



Source: IRENA (2023)

Malaysia has proven oil reserves, with most of its oil production coming from offshore fields in the South China Sea. While Malaysia was once a significant net oil exporter, its production levels have declined. Malaysia also possesses substantial natural gas reserves, which is another vital component of Malaysia's current energy mix.

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Malaysia's proven natural gas reserves are estimated to be approximately 42 trillion cubic feet as of 2021 (Knoema, 2023), an increase of only 0.56% yearly versus a 2% increase in energy demand. There is a vast difference in the demand growth rate of 1.44% compared to its reserve rate. As of 2020, Malaysia's oil production averaged around 613,000 barrels per day, while its oil consumption was approximately 720,000. The shortfall of 107,000 between production and consumption was met through imports. For natural gas, Malaysia is currently a net exporter of Liquefied Natural Gas (LNG). The country's natural gas production is around 2.3 trillion cubic feet (tcf) per year, while its consumption is approximately 1.4 (Zulkifli, 2021).

Malaysia's LNG exports are primarily to ASEAN markets. Malaysia's energy landscape is also vulnerable to global oil and gas price fluctuations, technological changes, and evolving energy policies. Regarding technology capability, implementing nuclear power requires a more special skilled workforce and specialised expertise. Malaysia Nuclear Agency (Nuclear Malaysia) possesses the know-how, expertise, competencies, infrastructure capabilities and prior experiences necessary to offer technical assistance and adequate sophisticated infrastructure to users adopting this technology currently within the medical, agricultural and industrial sectors since 1972 (Hazmimi et al., 2011). As such, preparations are being made for the eventual establishment of Malaysia's inaugural nuclear power facility.

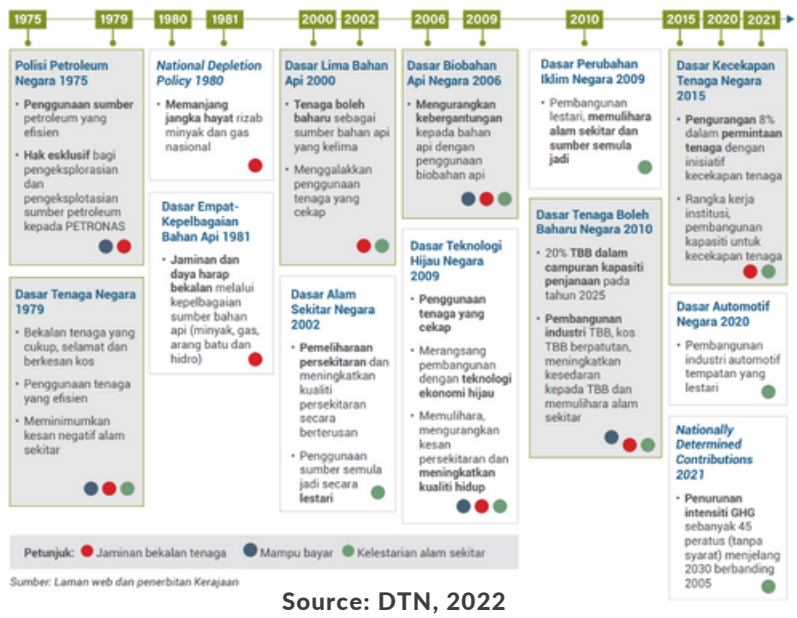
Nuclear Malaysia as Technical Support Organisation (TSO) is poised to function as a technical support entity, particularly in domains such as equipping and fine-tuning film badges to monitor workforce exposure indicators, maintenance and calibration conduct for a comprehensive list of nuclear equipment. Additionally, Nuclear Malaysia remains equipped to deliver training in safety, operations and maintenance, as well as ongoing awareness programs aimed at nurturing adept nuclear professionals essential for the competent operation of the nation's inaugural nuclear power plant. Nuclear Malaysia has outstandingly produced 73 patents of nuclear-based/related products for domestic and international usage (NM, 2023).

In terms of knowledge, Mely et al. (2014) stated that various higher learning institutions in Malaysia have years of experience offering nuclear-related subjects in Malaysia, proving their capability on nuclear energy. The complete list of the universities is detailed in Table 2 as follows. The study will evaluate its previous policy, the Four-Fuel Diversification Policies 1981, which were replaced by the Five-Fuel Diversification Policies in 2001, the current standing policy DTN 2040, and the energy diversification strategy towards nuclear energy. The policies on energy transition by years in the present-day context are illustrated in Figure 6. A research paper conducted by Awang et al. (2020) has further confirmed that Malaysia's policy guidance and implementation had successfully decreased its excessive reliance on crude oil/petroleum as its primary energy source.

Table 2: Universities in Malaysia Providing Nuclear-Related Subjects

University	Level of Study	Scope
Universiti Sains Malaysia (USM)	Undergraduate Postgraduate	Science Medical Physics (Applied). Medical Radiation Programme, Medical (Radiology) Education Certificate (PGEC) in Radiation's Protection and Safety
Universiti Putra Malaysia (UPM)	Postgraduate	Research of Applied Radiation including radiation synthesis and medical physics
Universiti Teknologi MARA (UiTM)	Undergraduate	Nuclear science (basic) and technology as selective subjects in the Diploma in Medical Imaging
Universiti Darul Iman Malaysia (UDM)	Undergraduate	Radiography (Diploma)
Universiti Teknologi Malaysia (UTM)	Undergraduate	Basic nuclear science and technology as a core subject in year 3 Health Physics – B.Sc. Application of radioisotope and radiation in industry
Universiti Kebangsaan Malaysia (UKM)	Undergraduate Postgraduate	Nuclear programmes in various postgrad levels Diagnostic, Imaging, Radiotherapy Programmes Medicine (Radiology) and Radiation Safety Science
Universiti Malaya (UM)	Undergraduate Postgraduate	Biomedical - including Nuclear Medicine, Technology and Medical Physics (M.Sc)
Universiti Malaysia Sarawak (UNIMAS)	Undergraduate	Medical Physics in Applied Science

Figure 6: Malaysia's Policy Regard to Energy Transition



Source: DTN, 2022

This reliance has been partially substituted with a dependency on natural gas on the supply side. This further suggests that the potential inclusion of renewable energy in the coming years could be crucial in achieving a genuinely effective and prosperous energy diversification strategy for Malaysia. From analysing several main pertinent elements of Malaysia energy's projection of reserve and demand, technology, expertise or knowledgeable workforce and policies, nuclear power's viability as a substitute for fossil fuels can be considered viable. However, conducting a thorough and data-driven assessment is paramount so policymakers and stakeholders can decide on the best energy mix to achieve energy security, further reducing carbon emissions and supporting sustainable development goals. Throughout the process, involving experts and the public and considering various scenarios is critical to arrive at the most suitable energy strategy for Malaysia's specific context.

Considering Impacts and Loopholes of Present-Day Initiatives

Incorporating nuclear power into Malaysia's energy mix can bring challenges and impacts that must be carefully considered. Here are some key challenges that have been highlighted. Regarding safety concerns, Malaysia occupies a geographically stable region beyond the 'ring of fire,' which means the country is not prone to external risks like earthquakes, volcanic eruptions and typhoons. Reaktor Triga Puspati (RTP) is the only nuclear research reactor in Bangi, Selangor, Malaysia, operated by Nuclear Malaysia. The safeguard of the nuclear-based materials in this facility is according to the Agreement for Safeguards of Nuclear Facilities and Material, INFCIRC/182, dated 18 May 1973, through an annual inspection (Nuclear Malaysia, 2007).

Numerous actors and stakeholders are interconnected within Malaysia's nuclear environment. Energy mix transition initiatives that have a significant impact on these parties will be a time-consuming effort. Displayed in Figure 6 is the nuclear technology landscape within the nation. Nuclear technology's application spans six distinct technical domains: medicine, environment, healthcare, agriculture, energy, safety and industry, and security. Numerous applications encompass irradiating devices sealed sources containing radioactive materials securely ensconced in appropriate capsules (Jamal et al., 2018). The most critical nuclear energy transition will focus on producing energy and addressing its environmental impact. Nofri et al. (2014), in their research paper modelling for nuclear output, simulated two power generation scenarios for 2030, which had been modelled as generation mix in 2013 and generation mix with 17.8% nuclear plant as targeted by the Ministry of Energy, Green Technology and Water Malaysia (KETTHA).

From the simulation report, it is proven that the cost of electricity generation in total, considering the amount of CO2 emission and overall system reliability measured, has strongly indicated that the generation mix of renewable energy nuclear power has been lowering operation and investment costs, as well as lowering CO2 emission and improve higher system reliability.

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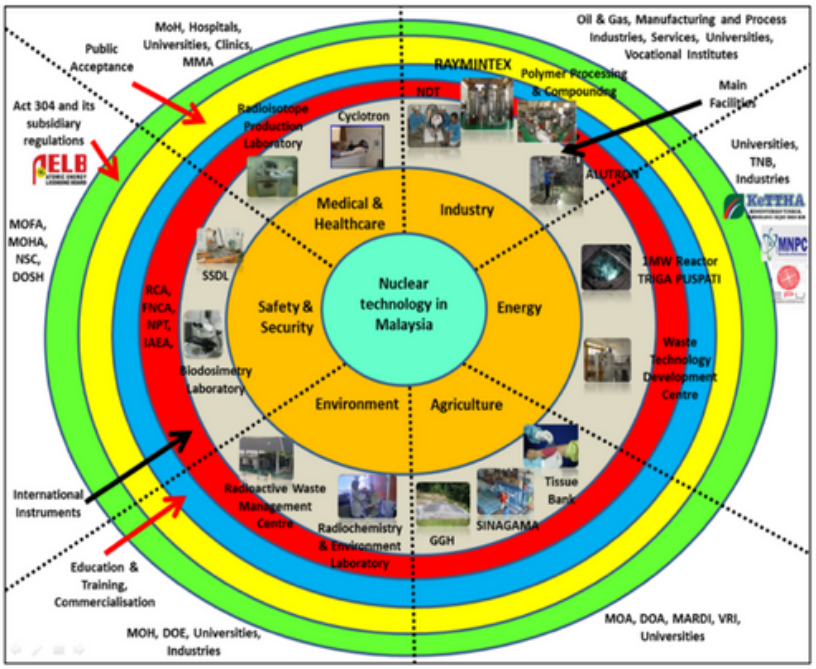
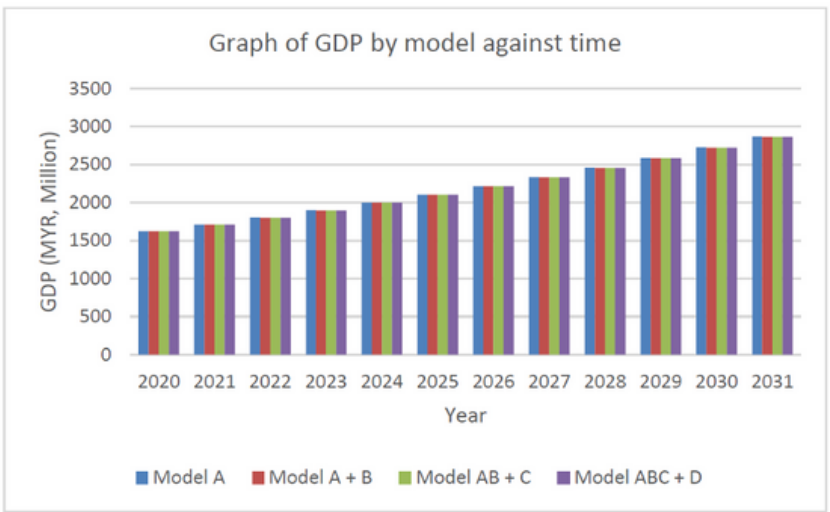
Figure 6: The whole Ecosystem of Nuclear in Malaysia



MOH: Ministry of Health, MMA: Malaysian Medical Association, NDT: Non-Destructive Testing, TNB: Tenaga Nasional Berliad, KETTHA: Ministry of Energy-, Green Technology and Water, MNPC: Malaysia Nuclear Power Corporation, EPU: Economic Planning Unit, MOA: Ministry of Agriculture and Agro-Based Industry, DOA: Department of Agriculture, MARDI: Malaysian Agricultural Research and Development Institute, VRI: Veterinary Research Institute, DOE: Department of Environment, MOFA: Ministry of Foreign Affairs, MOHA: Ministry of Home Affairs, NSC: National Security Council, DOSH: Department of Occupational Safety and Health, AELB: Atomic Energy Licensing Board

Source: Jamal et al., 2018

Figure 7: Malaysia Accumulated GDP As Impact on Nuclear Energy Transition



Source: Sharvesh et al., 2022

According to Sharvesh et al. (2022) in Figure 7, nuclear power's economic growth could directly impact Malaysia's accumulated Gross Domestic Product (GDP). Thus continuously showering Malaysia with prosperous economic growth and a reliable market for foreign investment. However, the author has identified some loopholes for Malaysia to enjoy nuclear energy perks and advantages. Among the important ones will be a stable government. The successful cultivation of Malaysia's nuclear energy mix hinges upon the foundation of a consistently stable government. A government that remains resolute and steady in its policies and decisions provides the essential framework for effectively addressing the multifaceted complexities inherent in the evolution of Malaysia's nuclear energy landscape. This stability ensures the coherence and continuity required to navigate the intricate challenges, rigorous regulatory requirements and intricate technological advancements in developing and implementing a nuclear energy strategy. Other than that, overdependencies on subsidies of RM 22 billion yearly were identified as significant issues by Praharsh and Bryan, 2023).

Recommendation

In a nutshell, glancing through Malaysia's current energy policies and unique circumstances, its energy needs need renewal. It requires a radical new approach based on human innovation relying on technology growth and market-based development. It will diversify Malaysia's energy mix, meeting its demands most efficiently by materialising these recommendations.

First, Malaysia's long-term energy policy shall support the transition to nuclear energy. In 2016, Malaysia Nuclear Agency Director General Dr. Muhamad Lebai Juri stated that nuclear energy will be able to keep the power tariff low compared to the present day. Imagine a small single pallet of six grams of uranium, which can produce the same amount as 149 pounds of oil, one-tonne weight of coal, and even 17,000 cubic feet of natural gas. In addition, it is the cleanest form of energy in terms of emission. Then, it is time for Malaysia to reduce electricity subsidies from RM 22 billion yearly to only RM 1 billion and eventually reduce them by 10% yearly starting in 2025. The saved money will be able to support the initial cost of setting up a nuclear power plant.

Public concern about nuclear waste management is a pressing issue, given the notable incidents like the Chernobyl Disaster in 1986, Fukushima Daiichi in 2011 and recent events such as waste leaks at the Hanford Site in the USA in 2022 and issues at Sellafield in the UK. The Mayak Production disaster in 1957 also serves as a historical reminder. These incidents emphasise the critical need for stringent safety measures and responsible waste disposal methods to safeguard public health and the environment. Addressing these concerns is paramount in building public trust and ensuring the accountable utilisation of nuclear energy. Waste management is considered low risk through technology optimisation and a highly efficient disposal process.

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In addition, a regulatory sandbox held in Singapore and the United Kingdom has shown significant effectiveness. It is a relaxation of regulation of the market's package that effectively assists in achieving holistic environmental objectives (Anderson, 2020). Among the lessons learned from 73 unique FinTech in 57 countries, sandboxes will serve as evidence for regulation, facilitate market entry for firms' partnerships, strengthen competition, enable market development, and build capacity within regulatory institutions. Malaysia shall consider a ten-year regulatory sandbox with specific criteria. Malaysia's renewable energy has failed mainly because too much consideration was placed on protecting the state-owned company - Tenaga Nasional Berhad (TNB) and safeguarding its profitability.

As far as the usage of nuclear energy is concerned and has been applied in several countries, it is well known that this type of energy source has many significant impacts on a nation. For instance, it produces large amounts of carbon-free electricity to protect air quality. In addition, using nuclear energy can significantly reduce carbon emissions. Therefore, it is safe to consider it is beneficial for the future air health of a country. It can also create more job offerings when broadly applied as one of the country's energy sources, as new power plants will surely need human resources.

Additionally, more research on the area will boost Malaysia's educational institutions in the sectors concerning nuclear energy. However, it is necessary to thoroughly weigh out its positive and negative impact before fully introducing it as one of the primary energy sources. The new project shall also take serious consideration of the nuclear energy mix. For example, the Suruhanjaya Perkhidmatan Air Negara (SPAN) had identified the potential to increase the water catchment area in Malaysia to support the current water supply system, and sewerage system cycles would be one of many options in adapting nuclear energy. Recommendations for optimising the SPAN project on water catchment include exploring innovative approaches funnelling to the nuclear energy mix.

Collaborative efforts among ministries and agencies can transform these catchment areas into multifunctional systems that benefit the nuclear energy ecosystem. Other than serving as power generation facilities for both solar and hydropower and supplying treated water to neighbouring countries, boosting profits, contributing to Malaysia's GDP and nuclear energy contributions. To enhance the efficiency of the water cycle, SPAN could consider modifying the hydropower supply by recycling water to move the turbines while ensuring water conservation.

Additionally, the water in the catchment can be utilised as a cooling medium for nuclear reactors, offering a dual-purpose application and maximizing resource utilization. Other than innovative approaches, the advent of new technologies and the possibility of discovering alternative resources, such as rare earth elements, with potential advantages over nuclear power should be thoroughly explored.

The government must provide robust support for scientific research into these new elements through dedicated expertise, ensuring a well-balanced allocation of effort and resources to yield promising results. In addition, enhancing the transparency and oversight of a nation's nuclear program is vital for ensuring the safe and responsible utilisation of nuclear energy at the very early stage of planning. One key aspect of this enhancement is regularly updating and presenting concept papers in Parliament. These concept papers serve as a crucial tool for educating legislators and the public about the intricacies of the nuclear program, fostering awareness and critical discussion on the nation's energy issues.

By tabling these concept papers at least twice a year, the government demonstrates its commitment to openness and accountability. It provides experts, lawmakers and citizens a platform to engage in informed debates, ask pertinent questions, and voice concerns. This proactive approach would bolster public confidence in the nuclear program and allow for timely adjustments and improvements based on evolving scientific, environmental and security considerations.

As a final recommendation, adopting renewable energy, such as nuclear energy, is considered a significant problem due to a need for more awareness. Only 49.4% of respondents knew well about government efforts or initiatives on renewable energy. Others could be less exposed and not of their concerns. Therefore, public awareness shall be aggressively introduced to society via social media. The effort is vital to ensure that extremism, misinformation, and apocalyptic narratives can be mopped out and the campaign can be funded through a specific environmental NGO.

Conclusion

The study wholeheartedly supports adopting nuclear power in Malaysia's energy mix, and this stance is based on several critical factors. The Malaysian government must take swift action in incorporating nuclear power into its energy strategy due to a combination of factors, including the depletion of fossil fuel resources, the necessity to comply with the UNDP greenhouse gas emission controls and the accessibility of nuclear power.

Firstly, the research emphasised the urgency of this transition due to the dwindling reserves of fossil fuels. As the tabled facts indicate, Malaysia's fossil fuel resources are depleting rapidly, making exploring alternative energy sources such as nuclear power imperative. Secondly, the commitment to adhering to greenhouse gas emission controls set by the UNDP is a compelling reason for embracing nuclear energy. Nuclear power is a low-emission energy source, which aligns with global efforts to combat climate change and reduce carbon emissions. Moreover, the availability of nuclear power as a viable energy source underscores its potential importance in Malaysia's energy mix.

Although the power generation process with small modular nuclear reactors may take some time to mature, the sooner action is taken, the sooner the country can benefit from this sustainable energy source. Addressing public concerns about safety is also crucial. The Fukushima reactor incidents as mentioned, resulted in only one death after several years compared to the toll of other natural disasters. This demonstrates that nuclear power can be a safe and reliable energy option when properly managed and regulated.

Additionally, the initial high cost associated with nuclear power can be mitigated through the normalisation of energy subsidies. This approach can make nuclear energy more economically feasible in the long run. Furthermore, the writer highlighted the importance of developing expertise in nuclear technology. This can be achieved through graduate programs at universities across Malaysia, ensuring a skilled workforce to manage and operate nuclear facilities safely. Finally, the writer raises a significant concern regarding political leaders' reluctance to adopt long-term nuclear energy due to their short-term service periods. Political leaders must prioritise the establishment of a solid foundation for nuclear energy adoption, considering the long-term benefits it offers in terms of energy security and environmental sustainability.

In conclusion, the study strongly advocates adopting nuclear power in Malaysia's energy mix. This stance is rooted in the pressing need to address resource depletion, greenhouse gas emissions and the availability of nuclear power as a sustainable energy source. It is crucial to address safety concerns, manage costs and cultivate expertise to ensure a successful transition. Political leaders must also prioritise the long-term benefits of nuclear energy adoption for the nation's future.

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The Statesman Journal
2023, Vol 1 68 - 80
ISSN-2811-454x

MALAYSIA'S COVID-19 MANAGEMENT: EVALUATING THE SUCCESS OF THE NATIONAL TASK FORCE (NTF) AND WHOLE-OF-GOVERNMENT AND WHOLE-OF-SOCIETY (WOGOS) STRATEGY

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Abstract

Malaysia and the rest of the world had been experiencing the deadliest global health crisis in early 2020 when COVID-19 struck most parts of the world. This pandemic exposed our health system's general weaknesses, particularly in countries with weaker healthcare capacity readiness and poor governance capability. Malaysia has a remarkable record of accomplishment in dealing with the pandemic, which occasionally occurred in our community. However, the impact and the magnitude of the COVID-19 pandemic have put our existing public healthcare machinery into testing. The government is well aware of the pressing need for intersectional cooperation to break the virus's transmission curve decisively. Under several deliberations, a National Task Force was formed to systematically handle border security management amid the influx of illegal migrants and rampant trans-border activities. The main objective is to put this unknown health status individual into better monitoring and control. After two and half years of great work, NTF is considerably the most successful interagency collaboration and cooperation, ultimately supporting the national agenda by flattening the pandemic curve. It was disbanded at the end of 2022 after the endemic had been declared. The experience and lessons learnt from NTF should be the standard operating model for the government, especially the National Security Council (NSC), in formulating future interagency operations in times of crisis.

Keywords: *National Task Force, Illegal activities, Border security management*

Introduction

Fact, science and solidarity are the critical metaphors advocated by the World Health Organisation (WHO) from the beginning of the COVID-19 pandemic outbreak in late 2019, later becoming the main WHO policy direction in dealing with the deadly global health crisis of this century. In hindsight, it illustrates constructive steps needed by nations to effectively mitigate the impact of this pandemic where all stakeholders collectively, particularly the health security strategy planners, need to base their actions on accurate information which has been scientifically analysed and implemented effectively through inter-sectoral cooperation, both public and private, and embracing community support and active involvement. At the global level, all countries need to cooperate in containing outbreaks of trans-border infections, which is a basis for providing appropriate aid to vulnerable member states with weaker or more disadvantaged healthcare systems. The WHO Director General, Dr Tedros ADhanom Ghebreyesus, has pointed out the need for concerted action in managing this global outbreak. He stated, "This pandemic is much more than a health crisis. It requires a whole of government and whole of society response" (Ortenzi et al., 2022).

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In managing this global outbreak in Malaysia, existing control measures were found inadequate, especially with the breadth of the outbreak involving the entire nation and the extended duration of the control measures instituted. This inadequacy of existing control measures required the adoption of a Whole-of-Government and Whole-of-Society (WOGOS) strategy to effectively address the spread of the outbreak and the consequences of the control measure instituted, thereby absorbing the impact, both short and long-term and, after that, facilitate the recovery phase from the pandemic. During this outbreak, it became evident that a comprehensive WOGOS strategy was needed to manage the nation's public health effectively. At the same time, ensuring that general livelihood and wellness are kept in check is also vital.

In the COVID-19 pandemic, Malaysia began to identify cases of infection in March 2020. However, the Ministry of Health Malaysia (MoH) started its health security planning in early December 2019 after the accumulation of confirmed cases reported in Wuhan, China, became evident. Several health-related guidelines from MoH were published to synchronise the efforts needed to face this imminent viral threat. A nationwide Movement Control Order (MCO) was enforced despite initial COVID-19 cases when the Sri Petaling Cluster outbreak occurred in late March 2020 (UNDP, 2023). This cluster resulted in many cases of individuals exposed to COVID-19, leading to the imposition of the first MCO. Because of the initial uncertainty of the nature of transmission of the COVID-19 virus and the speed by which it spread, it became imperative for the government to employ drastic measures to control the outbreak, particularly managing its transmission in and out across Malaysia's international borders.

In dealing with a national crisis, the government must employ all national power instruments and concentrate its limited resources at key decisive points. As the Ministry of Health (MoH) confronted the global threat posed by the rapidly spreading viral outbreak, it quickly became evident that the situation extended beyond its scope of authority. While the MoH implemented the initial measures for infectious disease control, the severity and transnational nature of the outbreak elevated it to a national security issue, necessitating involvement and management beyond the capabilities and jurisdiction of the MoH alone.

On 29 April 2020, the National Border Security Coordination Meeting No.1 2020 agreed to establish the National Task Force (NTF) headed by the Malaysian Armed Forces (MAF) as a concerted effort involving the participation of several key enforcement agencies such as the Royal Malaysian Police (RMP), Malaysia Maritime Enforcement Agency (MMEA) and the collaboration of the Royal Malaysian Customs, Malaysian Immigration Department, Ministry of Health (MoH) and Civil Defence Agency (Krishnan and Yusof, 2021).

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The NTF's main objective was to develop and execute a plan for monitoring and gathering information to coordinate security action plans and contain illegal entry of migrants at all of the country's entry gateway and border areas, including land, sea and air boundaries (Tharishini, 2020). This paper examines the role of the NFT, particularly in terms of its legal and operational authority and the ability to coordinate effectively among various agencies, viewed from a WOGOS perspective. It will analyse the success and effectiveness of the NTF and assess its influence on shaping future strategic outcomes in Malaysia, especially in the context of WOGOS strategy planning. Finally, the paper will conclude with recommendations to enhance the existing system and identify future opportunities and initiatives for WOGOS.

Challenges Faced by the NTF

Malaysia has had numerous crises arising from numerous emergencies from as early as the independence of Malaya in 1957, where interagency collaboration and cooperation were commonly used. For instance, Majlis Gerakan Negara (MAGERAN) and the Rejang Area Security Command (RASCOM), which were operationalised during Malaysia's second emergency era and the latest incident, the establishment of the Eastern Sabah Security Command (ESSCOM) after the 2013 Lahad Datu Incursion. However, the inception of NTF in the COVID-19 outbreak was based entirely on a different security environment to meet specific national strategic objectives and end-states. In retrospect, it was established to support an effort to fulfil more significant strategic requirements arising from the COVID-19 management master plan, as the National Security Council determined. Therefore, it is pertinent to examine the legality of the formation of NTF, where the military was tasked to lead all border security management operations.

The formation of the NTF was triggered by an urgent need to tighten Malaysia's international gateways to prevent the influx of migrants whose health status was unknown vis-a-vis unmonitored. During the peak of the pandemic, Malaysia was still an active recipient of refugees, asylum seekers and illegal migrants in the Southeast Asian region (UNDP, 2023). In short, enhancing these undocumented persons' detection, containment, and isolation was the top priority to support the current national control measures. In essence, the military was first called upon to support the national COVID-19 pandemic control measures during the initial implementation of the Movement Control Order ordered under Akta Pencegahan dan Pengawalan Penyakit Berjangkit 1988 (Akta 342) to augment the control measures implemented by the RMP and MoH. However, its role was later expanded to enhance border security management at the pandemic's peak. As enshrined in the Defence White Paper 2019 and National Security and Public Order Policy (Dasar Keselamatan dan Ketenteraman Negara (DKKA)), MAF must fully support the nation's WOGOS objectives.

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The formation of the National Task Force (NTF), as documented by Krishnan and Yusof (2021), took place on 7 May 2020, under the leadership of the Malaysian Armed Forces (MAF). This initiative was a strategic response to the escalating challenges of illegal border crossings. The NTF's foundational objective was to synergise efforts across relevant agencies, fostering a collaborative approach to managing border security threats, particularly amidst the pandemic. This integration was pivotal in reinforcing the operational capacity of security enforcement agencies, enabling them to address the multifaceted aspects of border security effectively. The structural framework of the NTF, which illustrates the interagency coordination and roles, is depicted in the accompanying diagram:

Diagram 1: NTF Organisation Structure

There are four components in NTF's contemporary structure: land, maritime, air, and logistics. All component commanders are responsible for participating in all integrated operations coordinated at NTF Headquarters and reporting directly to NTF Commander based on the existing chain of command. In other words, all agencies provide assigned forces to NTF under tactical command (Taccom) operational authority. In hindsight, it is a perfect arrangement during the crisis, such as minimising the time lap in delivering information and data, facilitating a quick decision-making process and generating a fast response on the ground. However, the decision to select a military commander to lead the NTF is unprecedented due to several factors.

First, it was an internal security crisis where Malaysia was not under immense physical armed threat from other countries or non-state actors. Second, there was no authorisation under any Malaysian laws for military personnel to conduct detention and investigation except under the supervision of authorised personnel such as police and other enforcement agencies. Third, no military commander has previously been tasked to head any interagency operations, even during intensive combat operations during the Sulu incursion at Lahad Datu in 2013.

From a different perspective, it should be noted that the deployment of the military in an internal security context and involving the civil populace was significant, and there was a constant demand for military personnel to be involved in human security operations. Furthermore, the Defence Minister in 2020 was also the Senior Minister in charge of security matters and the government's de facto lead minister for pandemic management in Malaysia. This dual role was one of the key policy initiatives regarding defence and security issues that focused on leading the response to the pandemic (Daniel, 2020). In short, this arrangement became a litmus test for the government's decision to delegate more authority to the Ministry of Defence and military in managing crises beyond its conventional defence role.

Significance of the NTF and Its Successes

The establishment of the NTF was significant not only for this contemporary pandemic crisis but also for a much deeper legacy that allows for future WOGOS approaches. This was Malaysia's first military-led interagency operation at the operational and tactical level to manage a national security crisis. It is debatable whether this arrangement had specific legal legitimacy from a legal perspective. To date, no particular laws authorise the use of military personnel for the detention of individuals and investigation in domestic enforcement operations. Therefore, the NTF had to operate under the umbrella of several domestic laws, such as the Police Act 1967 (Act 344), Customs Act 1967 (Act 235) and Immigration Act 1959/63 (Act 155). In other words, within this legal framework, the military supports existing domestic enforcement agencies in discharging duties related to the pandemic.

It establishes comprehensive command and control (C2) coordination at the operational level across all these agencies. In hindsight, this arrangement worked perfectly, as evidenced by the number of border encroachment cases significantly reduced during NTF operations (Mohamad, 2021). Regarding the smuggling of migrants (SOM) issue, it was noted that there was a significant surge in the number of reported cases from 2020 to 2022 which was probably due to intensified border control operations under the integrated command and control of NTF (Kenyataan Media Kementerian Dalam Negeri: Laporan Jabatan Negara Amerika Syarikat (JNAS) Mengenai Pemerdagangan Orang Tahun 2023). The following statistical information illustrates the number of reported illegal smuggling of migrants (SOM) over the past nine years.

Looking at the NTF's overall performance, it was reported that there were 14,268 cases involving illegal immigrants, smuggling, sea robbery, sighting and expulsion documented in 2022, which was almost 20% higher than the 11,970 cases reported in 2021. Thus, it can be seen that the NTF has significantly improved border security through OP BENTENG despite its ad hoc establishment. The diagram below illustrates the overall cases handled by the NTF in 2022.

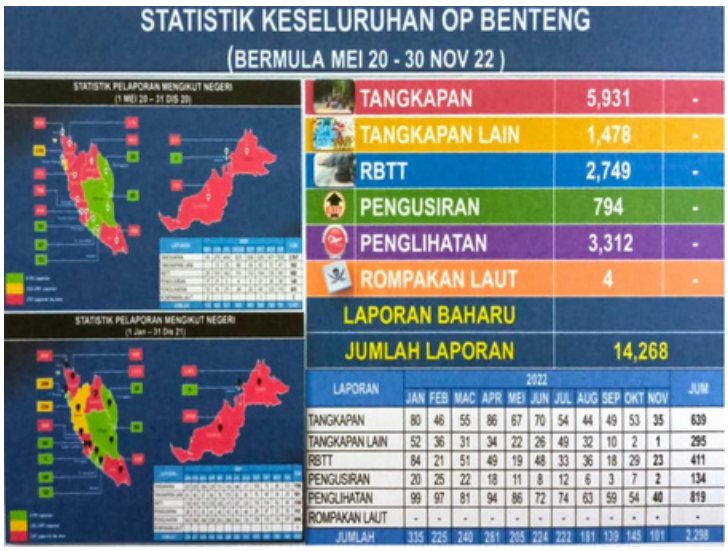
MALAYSIA'S COVID-19 MANAGEMENT: EVALUATING THE SUCCESS OF THE NATIONAL TASK FORCE (NTF) AND WHOLE-OF-GOVERNMENT AND WHOLE-OF-SOCIETY (WOGOS) STRATEGY

BILANGAN KES PENYELUDUPAN MIGRAN

PERKARA	TAHUN								
	2015	2016	2017	2018	2019	2020	2021	2022	2023*
JUMLAH KES	197	193	210	185	250	265	225	280	111
JUMLAH TANGKAPAN	227	202	282	221	371	505	393	521	227

Sumber data: D3 ATIPSOM, JSJ, Bukit Aman, PDRM
Sehingga: 31 Mei 2023

Source: Laporan Tahunan NTF 2022



LAPORAN	2022										JUM
	JAN	FEB	MAC	APR	MEI	JUN	JUL	AUG	SEP	OKT	NOV	
TANGKAPAN	80	46	55	86	67	70	54	44	49	53	35	639
TANGKAPAN LAIN	52	36	31	34	22	26	49	32	10	2	1	295
RBTT	84	21	51	49	19	48	33	36	18	29	23	411
PENGUSIRAN	20	25	22	18	11	8	12	6	3	7	2	134
PENGLIHATAN	99	97	81	94	86	72	74	63	59	54	40	819
ROMPAKAN LAUT	-	-	-	-	-	-	-	-	-	-	-	-
JUMLAH	335	225	240	281	205	224	222	181	139	145	101	2,298

Source: Laporan Tahunan NTF 2022

The NTF's success can be examined and explained in many ways. All these successes reflected institutional failures over the preceding years by the government and the National Security Council (NSC) in particular. This paper will elaborate on how these failures and weaknesses can become opportunities for success using the NTF construct within a WOGOS framework. First and foremost is the critical success factor. The NTF's success can be examined and explained in many ways. All these successes reflected institutional failures over the preceding years by the government and the National Security Council (NSC) in particular. This paper will elaborate on how these failures and weaknesses can become opportunities for success using the NTF construct within a WOGOS framework.

MALAYSIA'S COVID-19 MANAGEMENT: EVALUATING THE SUCCESS OF THE NATIONAL TASK FORCE (NTF) AND WHOLE-OF-GOVERNMENT AND WHOLE-OF-SOCIETY (WOGOS) STRATEGY

First and foremost, the key success factor of the NTF was the unity of command established throughout its operations. The NTF was allowed to access almost every border security operation conducted by various national security agencies along Malaysia's international sea and land borders. It obtained access to highly classified information such as overall operation plans, command and control structures, communication networks, data and statistics that become available through this chain of command. Besides this, the commander of the NTF reported directly to the Director General of the NSC and had direct access to all Heads of Departments and the Service Chiefs. Therefore, this abolished the previous stereotypical old-school bureaucracy system without compromising the chain of command functions. Doing so created greater flexibility while facilitating real-time information flow and fast decision-making processes. It was an unprecedented governmental decision by any standard in Malaysia's history, albeit driven by a rapidly progressing global crisis needing immediate and definitive action.

Through unity of command, all agencies could access valuable information obtained from each other's operations at all levels, which was previously difficult using normal channels. For instance, the real-time maritime information obtained through Operation Eye in the Sky by the Royal Malaysian Air Force (RMAF) along the Straits of Malacca could be useful in facilitating operations conducted by the Malaysian Maritime Enforcement Agency (MMEA), the Marine Police Force, Royal Malaysian Police (RMP), Fishery Department, Immigration Department and Royal Malaysian Customs operating in the same locality. Furthermore, with the platform provided by the NTF, more robust and precise coordinated operations were formulated, which were then executed systemically.

The second visible achievement was the sharing of resources by each participating agency. During the COVID-19 pandemic between March 2020 and April 2022, Malaysia's economy slumped, directly affecting the government's overall cash flow and the livelihood of the Malaysian public. The government of the day was compelled to inject stimulus packages to halt the collapse of the domestic economy, especially when the supply chain ecosystem came to a standstill (UNDP, 2023). As such, all enforcement agencies had to tighten their spending of funds and thus minimise the size of their operations due to budgetary cuts imposed during this time (Daniel, 2020). The prolonged pandemic control measures, prompted by the economic downturn, significantly impacted routine enforcement operations, especially in specific areas like border security. This shift in the government's focus and resources was a direct consequence of the extended nature of the pandemic restrictions. The NTF served perfectly as a mechanism to manage limited government resources while implementing prudent pandemic control measures. All its operations were carefully planned and executed, and an economy of effort concept was adopted.

Through the synchronisation of assets used, operations fully utilised their potential to deliver maximum return despite the cost-saving measures imposed by the nation's economic situation. An example is using the RMP Net as the primary communication network for OP BENTENG. During the initial commencement of NTF operations, the interconnectivity of communication networks among the agencies involved was a significant challenge. The main factors contributing to this problem were using different service and network providers and telecommunication radio set manufacturers. Second, the area of coverage and frequency varied tremendously between agencies.

Third, the voice procedures, reporting system and security classifications were vastly dissimilar. To solve this problem, the RMP Net was chosen as the central communication system for NTF because of its better performance and coverage than other available communication systems. This endeavour was successfully implemented with the RMP's full support using its existing Radio Sets stockpile without additional cost to the government (Laporan NTF, 2022). Therefore, several high-impact operations could be launched under the umbrella of OP BENTENG, which efficiently utilises assets owned by different agencies. In short, well-coordinated operations could reach their optimum return through proper planning. This went well beyond the capability of the contemporary NSC command and control structure.

The proper systemic operational planning and command and control system adopted by the NTF can be a key takeaway for our policymakers to look into in the near future. For the record, the NTF used standard military decision-making processes derived from contemporary Joint Operational Planning hierarchy guidelines adopted by the MAF in 2011 and widely used by military officers throughout their professional careers. The NTF was structured using Joint Staff Functions to foster a systemic analytical approach and design utilising staff work dynamics during planning and execution (Laporan NTF 2022). Doing so mitigated the gap between functional areas, improving the synchronisation of effort and resources used during tactical manoeuvres. It proved influential throughout the operational timeframe of the NTF despite most of its staff being drawn from other agencies outside of the MAF who may have yet to gain experience with joint operations.

It, in turn, provided an educational experience for those non-military staff from other agencies. From a broader perspective, it demonstrated proper standards of operation suitable for NSC functions in future operations or responses to crises. One of the main strategic objectives in the national management of the pandemic was to build the public's trust towards the government. Keeping the public informed of various government initiatives promotes transparency and situational awareness and encourages public involvement, undoubtedly elevating people's confidence.

In the case of the NTF, coordinated Information Operations (IO) as the multiplier to each tactical manoeuvre supported each operation under the banner of OP BENTENG. The section (J7) overseeing media operations was the main force driving the NTF and the government's agenda. The full utilisation of social media to reach the masses could shape public perceptions and serve as a preventive measure to curb potential illegal trans-border activities (Laporan NTF 2022).

To put it in context, the NTF's Facebook page had the highest approval rates among the contemporary official government social media platforms. It obtained 19,491 "likes", at least 21,439 followers, and 414,235 people reach (Laporan NTF, 2022). Subsequently, it perceivably managed to reduce illegal trans-border activities during this period. There were 5,804 cases reported after the establishment of the NTF in 2020 (Laporan NTF, 2022). The result may not seem to be great, but certainly, it was significant in overall terms. In hindsight, it implicitly reduced the burden on government resources by helping to flatten the pandemic curve and accelerate the achievement of the herd immunity target. In essence, NTF's operations had achieved its underlying objectives by elevating the effectiveness of National Border Management and, simultaneously, contributing towards the national strategic end state in managing this pandemic.

Recommendations

Undeniably, the formation of the NTF illustrated and provided awareness of weaknesses to the NSC and illustrated the failure of earlier measures to bridge the gap between government agencies effectively while efficiently synchronising limited government resources. As such, this paper recommends several suggestions for future consideration. The NTF was a proven workable interagency model suitable for use during emergencies and crises. Despite the short period of collaboration and cooperation, all agencies involved managed to integrate at least at an operational level to deliver the actions needed to address a national crisis successfully. The successful integration of command and control, communication, logistics, and tactical manoeuvre coordination without compromising security, safety and, most importantly, the management of the legal implications allowed the NTF greater freedom of action in planning and executing operations to manage and mitigate the challenges brought on by the crisis.

Therefore, it is highly recommended that the government adopt this model, which can be written as a Standard Operating Procedure (SOP) or NSC Directive. Regrettably, NTF was disbanded in 2022 after the international borders were reopened and community herd immunity target was achieved. This decision came without surprise due to several factors.

First, the ownership of the internal security domain remains with the Home Ministry. Second, the limited resources available, particularly the emoluments needed to create a new organisational structure for a continued NTF, were not available nor seen as sustainable from a budgetary standpoint for its permanent establishment. Lastly, the threat of the pandemic was diminished, as exemplified by the flattening of the COVID-19 infection curve, which was deemed to imply minimum future risks. In short, the NTF was seen as only a temporary measure to deal with the pandemic crisis.

As such, to maintain the momentum gained from the NTF function and its ability to provide for a coordinated national crisis operational management system, the NSC should consider regrouping the expertise and experiences gained by organising periodic interagency exercises, particularly in crisis management of threats such as pandemics, transnational natural disasters and accident as well as for other non-traditional threats. Maintaining the legacy of the NTF is crucial in binding all national security agencies to work together under a common framework for the near future. From the experience of the NTF, there is an obvious need for the NSC to conduct institutional reform, significantly improving the structure, command, and control of the NSC. Currently, the NSC monitors all national operations through the Pusat Pengurusan Operasi Negara (PPON). In truth, PPON only provides for consultation, information sharing, and monitoring of all agencies' operations without any practical involvement in command and control or synchronising effort and resources. Each agency still maintains its discretion in decision-making, using forces and resources and, most essentially, possessing its departmental bureaucracies. As such, gaps remain prevalent among each national agency and are individually unable to integrate without proper operational and tactical command, control, and effective leadership structures.

In many agencies, the organisational structures are administrative but do not lend themselves efficiently to operational requirements, especially on a larger or national scale. In essence, the legacy of the NTF will remain just as a page in history if the lessons learnt are not used and used to seek organisational transformation for the nation's good by policymakers in the NSC. Accordingly, it is highly recommended that a national-level operational headquarters with a robust command and control structure be established by restructuring each agency's contemporary command and control system, considering future joint operations in large-scale crises or inter-agency collaborative processes. This could reduce duplication of tasks, mitigate areas of overlapping operation, optimise resources that could be shared, avoid the underutilisation of assets and expertise, encourage information sharing and enhance better interoperability at the tactical level. Explicitly, it can induce transformation within agencies by reducing their bureaucracies, improving unity of command among agencies, and encouraging similar working cultures and better understanding and integration within interagency environments.

In essence, these are the areas where the PPON and NSC struggle to achieve success thus far. To facilitate the comprehensive integration of military involvement within a Whole-of-Government Operations (WOGOS) framework, it is recommended that a thorough review of the National Security Council (NSC) Act 2016 be undertaken. This review should focus on amending provisions to grant the military the authority to spearhead operational and tactical coordination in interagency operations. The existing National Task Force (NTF) framework needs more detailed guidance on this critical aspect. This issue must receive adequate attention and resolution during the forthcoming mid-term review of the Defence White Paper 2019, slated for commencement in 2024. This adjustment will ensure that military contributions are optimally leveraged within the WOGOS context, enhancing overall national security and operational efficiency.

Conclusion

In conclusion, the COVID-19 pandemic has implicitly and explicitly put the government of Malaysia to the test, involving both its vision and effectiveness in handling the deadliest health crisis of the century. As a developing nation, limited resources and expertise compelled the government to adopt inter-sectoral collaboration and cooperation to combat the pandemic and decisively restore the status quo. The formation of the NTF was initially done out of anticipation of the potential influx of illegal immigrants and the surge of trans-border activities in the absence of proper monitoring and control, thus complicating the control of the pandemic within the borders of the nation. Despite being formed hastily, the NTF has proven its existence by managing incredible numbers of trans-border events and showing inclusiveness in integrating all enforcement agencies, which already have their own SOP, legitimacy and, most importantly, pride in their organisation.

The success of the NTF was very significant in many ways, particularly in advocating unity of command, which the NSC still needs to do over its decades of existence. Besides that, the NTF was an exceptional example of how resources and tactical manoeuvre could be adequately synchronised and fully utilised at their optimum values. The signature example was using RMP Net across several agencies, which had never been considered before. In shaping public confidence, the NTF maximised the use of social media platforms to keep the public engaged, especially in monitoring and controlling the movement of illegal immigrants and trans-border activities.

Despite being discontinued with the declaration of the Recovery Phase in 2022, the NTF had set several precedents, which can be a reference in the future. It is highly recommended that this NTF model be fully absorbed into NSC standard operating procedure and a working culture where the jointness among agencies is fully integrated.

MALAYSIA'S COVID-19 MANAGEMENT: EVALUATING THE SUCCESS OF THE NATIONAL TASK FORCE (NTF) AND WHOLE-OF-GOVERNMENT AND WHOLE-OF-SOCIETY (WOGOS) STRATEGY

Continuous training and exercises should be held to keep the momentum and the legacy of the NTF. It could be an annual event based on different scenarios depending on the contemporary security environment. Lastly, it is recommended that the existing operational and tactical headquarters operations room be restructured and integrated to reduce overlapping of tasks in operations, improve shared resources and information and minimise bureaucracy among agencies.

In essence, the central idea leading to the creation of the NTF was shown to be plausible and ultimately workable through the course of the COVID-19 pandemic. The disbandment of the NTF at the end of 2022, while seemingly prudent financially, seems to create more questions than answers, especially regarding the government's determination to advocate a WOGOS strategy in the future to manage national security threats and crises.

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The Statesman Journal
2023, Vol 1 82 - 96
ISSN-2811-454x

SUSTAINABLE MANAGEMENT OF RESOURCES FOR NATIONAL SECURITY

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Abstract

With rich rainforests, oil and gas reserves, fertile land and pristine waters, Malaysia faces the challenge of managing these resources sustainably. Oil and gas, clean water, palm oil, rubber, timber and fisheries resources drive its economy and support millions of livelihoods. Balancing economic growth with resource preservation is a significant challenge, given global environmental concerns and the imperative of sustainable development. This paper addresses the following questions: (1) What are Malaysia's current policies and approaches for the sustainable management of natural resources? (2) What are the issues, challenges and gaps between Malaysia's existing policies and the best practices observed in other regions? (3) How can concepts and guidelines be developed to manage essential resources in Malaysia effectively in alignment with the United Nations Sustainable Development Goals (SDG) for 2030 and Malaysia's Shared Prosperity Vision 2030? In answering these questions, the paper employed a qualitative research methodology based on the data collected primarily from secondary sources such as journals, articles, books and studies from various scholars. It especially delves into the Malaysian government's significant security challenges in sustaining natural resources. The paper examines how Malaysia manages its natural resources sustainably. It evaluates existing policies and underscores gaps between Malaysia's local and international best practices. The study suggests ways to enhance resource management, aligning them with the United Nations' Sustainable Development Goals for 2030 and Malaysia's Shared Prosperity Vision 2030. The analysis provides essential lessons on sustainable development for countries rich in resources. Additionally, it underlines the constant need for alertness and flexible strategies to tackle changing challenges successfully.

Keywords: *Malaysia, Natural Resources, National Security, Resource Management, Shared Prosperity Vision 2030, United Nations Sustainable Development Goals (SDG) for 2030*

Introduction

Malaysia's unwavering dedication to the delicate balance between developmental aspirations and ecological preservation is exemplified by a multifaceted tapestry of policies and approaches. In a world of resource scarcity and environmental challenges, Malaysia emerges as a steadfast advocate for sustainable resource management. This intricate symphony of strategies harmonises historical evolution, contemporary responsiveness and visionary future trajectories, offering a harmonious blend of tradition and innovation. Natural resources are the lifeblood of our planet, providing essential elements that sustain life, drive economies and shape our environment. They can be broadly categorised into several groups with unique characteristics and importance.

SUSTAINABLE MANAGEMENT OF RESOURCES FOR NATIONAL SECURITY

Renewable resources, such as biotic and abiotic components, can remarkably rejuvenate themselves over time. These resources include the bounty of forests, the riches of fisheries, the promise of agricultural harvests, the power of wind and solar energy and the flowing strength of water for hydropower. In contrast, non-renewable resources bear the burden of finite availability. Fossil fuels like coal, oil and natural gas fuel our industrialised societies but come with an expiration date. Precious minerals and non-metallic elements form the bedrock of our infrastructure and technological progress, but their scarcity demands judicious management.

Energy resources drive our modern world, from conventional fossil fuels to the promise of renewable alternatives, revolutionising how we power our lives. Water, the solution of existence, shapes the landscape, quenches our thirst and drives hydroelectric energy. Land, soil and the intricate biological systems that inhabit them form the foundation of our food, shelter and biodiversity. The vast oceans and hidden depths offer marine resources, from sustaining marine life and fisheries to untapped minerals and energy potential. These categories underscore the intricacies of our reliance on natural resources, emphasising the need for stewardship, conservation and sustainable management to ensure their availability for future generations. Our interactions with these resources shape our planet's future, making responsible practices and a deep understanding of their value essential for a sustainable tomorrow (Development, 2023).

Malaysia, a country renowned for its lush rainforests, abundant oil and gas reserves, fertile land and pristine waters, is faced with the critical task of managing its diverse natural resources sustainably. These resources, including oil and gas, clean water, palm oil, rubber, timber, fisheries and marines, play a pivotal role in the nation's economy, providing essential raw materials, energy and livelihoods for millions of Malaysians (The World Bank, 2013) However, as the world grapples with environmental concerns and the need for sustainable development, the Malaysian government faces significant challenges in balancing economic growth with preserving and responsible use of these invaluable resources. While Malaysia's commitment to sustainable resource management is admirable, challenges emerge as opportunities for growth. Inadequate enforcement mechanisms and limited public awareness create gaps that demand strategic recalibration.

Vigilant oversight and technological innovation offer avenues to strengthen policy implementation while engaging the public through education and awareness campaigns, cultivating a culture of responsibility. To navigate these challenges, a blueprint emerges, woven from innovative concepts and forward-looking guidelines. Public engagement becomes the heartbeat of responsible resource stewardship, forging a connection between governance and the citizenry.

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Malaysia's Shared Prosperity Vision 2030 (SPV 2030) is an economic development initiative and vision introduced by the Malaysian government. Launched by Tun Dr Mahathir bin Mohamad, Prime Minister of Malaysia, Putrajaya, On 5 October 2019, by leveraging the resources available in the country, including the talent, skills and expertise of the rakyat in various fields, it is possible to drive the country's economic growth and improve the rakyat'sincome. With the rapid development of the economy over the past six decades, Malaysia has now moved its position to be in the high-income category. This vision replaces the previously aimed Vision 2020, recalibrating Malaysia's economic targets and social aspirations (General, 2019).

As Malaysia's resource management reverberates, a future of sustainability, resilience and prosperity beckons. To shape this future, strategic recommendations offer a compass for action. Enhanced enforcement mechanisms empowered public engagement, digital integration, and public-private collaborations are pillars of resource optimisation. As stated in the United Nations (UN) Sustainable Development Goals (SDG) 2030, all countries and all stakeholders, acting in collaborative partnership, will implement this plan as stated (United Nations, 2015). Building capacity and consistently evaluating and offering incentives enhance Malaysia's path to comprehensive sustainability. By adopting these suggestions, Malaysia's approach to resource management will peak in harmonious perfection, leaving a lasting legacy of responsible care that echoes through generations and beyond borders.

National Security Policy - Malaysia's Commitment to Sustainable Development

As the global energy landscape shifts quickly, energy security is now a top priority for countries worldwide. The reliance on traditional fossil energy sources has been a cornerstone of economic development, but it comes at a cost. The imperative to transition to cleaner and more sustainable alternatives has never been more urgent, both to mitigate the impact of climate change and to reduce the potential for regional and international conflicts arising from the scarcity of these resources. As a responsible and forward-thinking nation, Malaysia recognises the significance of energy security. As highlighted in its national security policy, Malaysia acknowledges that continued reliance on fossil fuels must be a transitional phase, moving towards extensively utilising cleaner, more affordable, renewable energy sources (National Defence Council, 2021). This commitment aligns with Core Value 7: Sustainable Development. Sustainable development is the key to balancing the needs of present and future generations while ensuring the nation's economic, social, demographic and environmental progress.

To achieve this equilibrium, Malaysia emphasises the integration of security concerns into its development plans. It recognises that unequal development may lead to ecological and demographic imbalances, undermining the nation's stability and prosperity. Malaysia has adopted a set of primary strategies to implement these crucial principles.

Strategy 13 focuses on fully implementing sustainable development policies, giving due consideration to security, ecology and demography. It aims to enhance awareness among society and relevant stakeholders regarding the critical interconnection between sustainable development and national security. Strategy 14 underscores the efficient management of national resources. Malaysia aims to reduce overreliance on foreign assets by optimising resource utilisation and encouraging research for alternative solutions. This strategic move will ensure the nation's survival and contribute to a more sustainable global energy landscape. Malaysia's commitment to energy security (fossil fuel) and sustainable development demonstrates its dedication to safeguarding its citizens' well-being and future generations' interests. As the world grapples with uncertainties, Malaysia's policies provide hope, emphasising the connection between security, development and responsible resource management.

Current Policies and Approaches in Malaysia

Malaysia's unwavering commitment to sustainable resource management is emphasised by its intricate policies and approaches to balancing developmental needs with environmental preservation. A noteworthy example of this commitment is evident in the era of Security and Development Policy (Keselamatan dan Pembangunan [KESBAN]), which was introduced by the 2nd Prime Minister of Malaysia, the late Tun Abdul Razak bin Hussein, in 1971. Malaysia embarked on a transformative journey to confront internal security challenges head-on (Abdul Latif Harun and Nur Surayya, 2020). This pivotal period has marked a strategic shift, placing resource mobilisation on the nation's agenda. As internal security became a paramount concern, the government marshalled financial resources more prudently, channelling investments into fortifying security infrastructure and bolstering the development of a skilled and capable human resources pool. This concerted effort elevated the nation's security apparatus and exemplified Malaysia's prowess in resource optimisation to meet critical objectives.

Central to Malaysia's sustainable resource management endeavours is the proactive engagement of its citizens. The KESBAN era saw the amplification of citizen involvement through innovative community-based initiatives, serving as a testament to the power of collective action in fortifying local resilience. These grassroots-driven endeavours went beyond conventional approaches, forging a bond between government agencies and society. Malaysia sowed the seeds of sustainability by fostering a sense of ownership and responsibility within communities, ensuring the nation's valuable resources were protected and leveraged for the greater good. Malaysia's multifaceted policies and approaches underscore its dedication to sustainable resource management. The KESBAN era exemplifies the nation's capacity for strategic resource allocation in addressing security challenges, while citizen engagement initiatives cement the foundation for local resilience (Abdul Latif Harun and Nur Surayya, 2020).

As the nation navigates its developmental journey, these diverse approaches collectively echo Malaysia's resounding commitment to the prudent stewardship of its natural resources.

Malaysia's Natural Resources

Malaysia, a land of lush landscapes and abundant biodiversity, is blessed with a rich tapestry of natural resources that form the backbone of its economy and support the livelihoods of millions. These resources include petroleum products such as crude oil and liquefied natural gas, which are the most valuable natural resources of the country. These reserves account for the most significant chunk of the country's export revenue and play a massive part in the country's power generation (Britannica, 2022). Palm oil plantations make Malaysia the world's leading palm oil producer and a significant rubber producer. The country's economy heavily relies on the palm oil industry. These resources play a pivotal role in shaping the nation's identity and driving its development, including the flowing rivers of clean water, the evergreen forests yielding timber, and the bountiful fisheries that grace its coastal waters. These natural resources are pivotal in shaping the nation's identity and driving its development. Malaysia's natural resources have been managed sustainably and intelligently, which has helped the country convert an abundance of natural resources into long-term sustainable growth. The country's sound policy choices ensured that revenues from resource extraction were reinvested in the economy through machines and buildings to generate sustained economic growth.

Oil and gas

Malaysia is a key player in the global oil and gas industry, with substantial reserves and a well-established production infrastructure. This resource has been a driving force behind the nation's economic growth. However, the government faces the challenge of managing these non-renewable resources while diversifying the economy to reduce dependency on revenue from oil and gas. According to the Organisation of the Petroleum Exporting Countries (OPEC), Malaysia's crude oil production has decreased since 2018. In December 2022, Malaysia produced 396,915 barrels of crude oil daily, a decrease from the previous year's production of 418,049 (CEIC, 2022).

Additionally, environmental considerations, such as reducing carbon emissions and promoting cleaner energy sources, pose a pressing challenge in the transition towards sustainable energy solutions. Petroleum products, such as crude oil, natural gas and liquefied natural gas, are the most valuable natural resources of the country. These reserves account for the most significant chunk of the country's export revenue and play a massive part in the country's power generation (Bada, 2018). Its substantial reserves and robust production infrastructure underscore Malaysia's significance in the global oil and gas industry.

These reserves have fuelled the nation's economic growth and established Malaysia as a prominent player in the international energy market (USEIA, 2021). However, the Malaysian government is tasked with effectively managing these non-renewable resources while diversifying the economy to reduce overreliance on oil and gas. This challenge stems from the need to ensure a sustainable economic trajectory that does not become overly dependent on finite resources, thus safeguarding the country's long-term stability and resilience. As the world shifts its focus towards sustainable development and combating climate change, Malaysia's government faces the pressing need to address environmental considerations in the energy sector (IEA, 2020). The reduction of carbon emissions and the promotion of cleaner energy sources are pivotal aspects of this transition. The country's commitment to the Paris Agreement highlights the urgency of adopting low-carbon energy solutions (UNFCCC, 2021).

The alignment of national energy policies with global environmental objectives presents a multifaceted challenge, requiring strategic planning, technological innovation and policy implementation. Therefore, developing and deploying renewable energy technologies, such as solar, wind and hydroelectric power, are essential in mitigating the environmental impact of traditional fossil fuel use. Integrating these cleaner energy sources into Malaysia's energy mix necessitates substantial investments in infrastructure, research and development. The government must foster a conducive environment for private sector participation and innovation in the renewable energy sector to drive this transition effectively. Collaborative efforts between government, industry and the research community, guided by forward-looking policies, will be pivotal in overcoming these multifaceted challenges and steering Malaysia toward a more sustainable energy future.

Clean water

Access to clean and safe drinking water is a basic necessity and a fundamental human right recognised globally. Due to its tropical climate and extensive river networks, Malaysia has abundant freshwater resources. However, the escalating demand for water due to population growth, coupled with pollution stemming from industrial activities and deficiencies in water infrastructure, presents a clear and imminent threat to the sustainability of this invaluable resource. Balancing the imperative to ensure equitable access to clean water for all Malaysians while safeguarding water sources from contamination and depletion poses a multifaceted challenge that necessitates immediate attention and effective management strategies by the Malaysian government. Ensuring equitable access to clean water while protecting water sources from contamination is a crucial challenge for the Malaysian government. According to a report by the United Nations Special Rapporteur on Human Rights, 92% of the population of Malaysia has access to well-managed water services for safe drinking water and sanitation (UN HR Council, 2021).

Notably, this new National Security Policy 2021 – 2025 is an improvement over the 2017 version as sustainable development has been identified as a core value, the first element of which is "water security" (EPU, 2022).As urbanisation and industrialisation continue to expand, particularly in Malaysia's rapidly developing regions, there is mounting pressure on water resources (Moriken Camara, 2019). Industries often discharge pollutants into water bodies, contributing to water pollution and compromising the quality of available water sources. For example, in some areas, as former Environment and Water Minister Tuan Ibrahim Tuan Man mentioned, only 71.7% of the 1.7 million Kelantan residents have access to clean water (Chung, 2021).

Inadequate water infrastructure exacerbates the situation, leading to inefficiencies in water supply and distribution, especially in Kota Bharu, Machang, Pasir Puteh, Tanah Merah and Pasir Mas. He also noted that the construction of the two reservoirs in Kelantan, estimated to cost RM1.8 billion and spanning over 1,000 acres in size, would be able to address water supply problems. Mitigating these challenges requires a comprehensive approach that includes strengthening regulatory frameworks, promoting sustainable water management practices, investing in modern and efficient water treatment facilities and raising public awareness about water conservation. Prioritising investment in water infrastructure, implementing effective pollution control measures and establishing robust monitoring systems to ensure water quality is essential to protect this resource for present and future generations (Mahmud, 2021).

The Malaysian government must collaborate with the private sector, local communities and environmental organisations to develop and implement strategies that address both the demand-side and supply-side challenges related to clean water access. Only through a concerted effort, guided by sound policies and sustained commitment, can Malaysia overcome these pressing challenges and secure the right to clean and safe drinking water for all its citizens in alignment with global human rights principles. On the same page, Water Sector Transformation 2040 has reported that the Federal Government plays a prominent role in planning, developing, regulating and financing water resources governance. It is realised by developing long-term plans that emphasise conserving and preserving water resources, water supply and services, demand management and environmental sustainability.

Palm oil

Palm oil is a vital export commodity for Malaysia, contributing significantly to the nation's economy. Palm oil plantations make Malaysia the world's leading producer of palm oil and a major producer of bananas, cocoa, coconuts, pepper, pineapples, rice, rubber and tea. The country's economy heavily relies on the palm oil industry (Fact and Details, 2019 - 2023).

However, palm oil cultivation has triggered widespread concerns due to its association with deforestation, leading to habitat loss and adverse impacts on biodiversity. Finding a balance between reaping the economic benefits of palm oil production and ensuring responsible land use, along with implementing conservation efforts and sustainable agricultural practices, is a complicated and multifaceted task that requires a comprehensive approach to policymaking and strict implementation. Balancing the economic benefits of palm oil production with responsible land use, conservation, and sustainable agricultural practices is a complex task that requires careful policy formulation and implementation.

According to the Malaysian Palm Oil Board (MPOB), Malaysia's palm oil industry experienced a slight increase in crude palm oil (CPO) production and export in 2022 compared to 2021. The output of CPO increased by 1.9% to 18.45 million tonnes in 2022 from 18.12 million tonnes in 2021. According to Datuk Dr Ahmad Parveez Ghulam Kadir, Director General of the Malaysian Palm Oil Board (MPOB), the export of palm oil and other palm-based products also increased by 1.8% to 24.72 million tonnes in 2022 from 24.28 million tonnes in 2021. The expansion of palm oil plantations has been a significant driver of deforestation in tropical regions, including Malaysia. Vast tracts of forest land, rich in biodiversity, have been cleared to accommodate palm oil cultivation, leading to the displacement of native species and the degradation of essential ecosystems.

According to satellite data from Global Forest Watch, between 2002 and 2020, humid primary forests shrunk by 17% in Malaysia (Pablo Robles, 2021). This rapid expansion has drawn international attention, leading to calls for more sustainable approaches to palm oil production. Mitigating these concerns requires robust policies prioritising responsible land use and sustainable agricultural practices. A crucial aspect is enforcing regulations discouraging the conversion of primary forests and other high-conservation-value areas for palm oil cultivation (Insights, 2023).

Promoting sustainable practices, such as agroforestry and the use of degraded lands, can help minimise the effect on natural habitats while maintaining the economic viability of the palm oil industry. Certification schemes, such as the Roundtable on Sustainable Palm Oil (RSPO), have been established to encourage responsible palm oil production (RSPO, 2023). These initiatives aim to promote environmentally friendly practices, reduce deforestation and respect the rights of local communities. However, the effectiveness of such schemes depends on strict adherence and monitoring. Engaging stakeholders, including government bodies, palm oil producers, local communities and environmental organisations, in a collaborative effort, is essential to addressing the challenges palm oil cultivation poses. Balancing the economic potential of this industry with conservation efforts, biodiversity protection, and sustainable land management can pave the way for a more sustainable palm oil sector in Malaysia, contributing to economic growth and environmental preservation.

Rubber

Malaysia primarily produces natural rubber, contributing significantly to the global rubber industry. Sustainable management of rubber plantations, innovation in rubber-based industries and ensuring fair prices for rubber farmers are among the challenges faced by the government to maintain the viability of this sector. As a significant player in the global rubber industry, Malaysia boasts a robust position as a primary natural rubber producer. The country's contributions to the rubber sector are substantial, but alongside these contributions come intricate challenges that necessitate astute management strategies.

Among the challenges faced by the Malaysian government is the imperative to maintain the viability of the rubber sector. This entails striking a delicate balance between sustainable rubber plantation management, fostering innovation within rubber-based industries and guaranteeing equitable pricing mechanisms for rubber farmers (Muhammad Fadzli Ali, 2021). Ensuring that rubber plantations are managed sustainably is paramount to prevent detrimental impacts on the environment and the long-term productivity of this sector. Addressing concerns related to land use practices, water management, and the responsible use of agrochemicals is essential (Silva, 2022). Implementing proper land tenure and encouraging best practices promoting soil health and biodiversity within rubber plantations can contribute to sustainable growth.

The government's challenge extends to fostering innovation within rubber-based industries to enhance the value chain and diversify product offerings. Encouraging research and development in rubber technology, exploring new rubber applications in emerging industries, and supporting small and medium enterprises (SMEs) in the rubber sector can drive innovation (Rubbr, 2022). Collaboration between industry players and research institutions is vital to identifying new market opportunities and staying competitive in the global rubber market.

Timber

Forests significantly reduce the risk of natural disasters, including floods, droughts, landslides and other extreme events. At the global level, forests mitigate climate change through carbon sequestration, contribute to the balance of oxygen, carbon dioxide and humidity in the air and protect watersheds, which supply 75% of freshwater worldwide (UN Affairs, n.d). Malaysia's lush and diverse forests are emblematic of its natural beauty and play a crucial role in supporting various ecosystems and contributing to the nation's thriving timber industry. Evergreen forests yield timber, an essential natural resource for Malaysia. They are also extensive habitats for diverse flora and fauna (Iqbal, 1986).

However, managing this precious natural resource requires a delicate equilibrium, entailing the harmonisation of responsible forestry practices, robust biodiversity conservation efforts and stringent measures to combat illegal logging. Continuing this delicate balance is essential to ensure the sustainable management of timber resources, safeguarding them for present and future generations. The responsible management of timber resources necessitates sustainable forestry practices that minimise the environmental impact of logging activities. Implementing selective logging techniques, adhering to designated logging quotas and complying with reforestation and afforestation requirements are critical steps. Striving for certified sustainable forestry practices, such as those recognised by organisations like the Forest Stewardship Council (FSC), can contribute to environmentally sound timber harvesting (Forest Stewardship Councils, 2021). Preserving the rich biodiversity found in Malaysia's forests is paramount. The fragmentation of habitats due to logging activities can disrupt ecosystems and threaten numerous plant and animal species.

Establishing protected areas, incorporating buffer zones and promoting rehabilitating degraded forest areas can help conserve biodiversity within timber-producing regions. Combating illegal logging is crucial for sustainable timber management due to its negative environmental and societal impacts. Addressing this requires strict regulations, enhanced monitoring, harsh penalties and community-based forest management. Effective solutions demand collaboration between government agencies, forestry firms, local communities and environmental groups. This collaborative approach ensures that Malaysia's timber sector remains economically beneficial while conserving the forests' ecological health.

Fisheries and marine biodiversity

Malaysia's extensive coastline and rich marine biodiversity support a vibrant fishing industry, providing food and livelihoods for coastal communities. As with other resources, sustainable practices are essential to ensure the long-term viability of this vital sector. This series explores these natural resources, their significance, challenges and the country's efforts to balance economic growth with environmental sustainability. This crucial marine resource faces daunting challenges that threaten its sustainability: overfishing, habitat destruction and the pervasive impacts of climate change. If left unchecked, these threats could endanger the fishing industry's future viability, a cornerstone of the nation's economy and jeopardise the well-being of the communities that depend on these marine resources for their livelihoods (WWF-Malaysia, 2021). The Malaysian government plays a pivotal role in addressing these challenges by adopting comprehensive and science-driven policies. Collaborating with the fishing industry, local communities, environmental organisations, and international bodies is essential to developing effective strategies for the sustainable management of coastal waters. By investing in conservation, responsible fishing practices and climate resilience,

Malaysia can ensure that its invaluable marine resources continue to thrive, benefitting the nation's economy and the coastal communities that rely on them.

Guiding Principles for a Better Future

Efficiently overseeing the utilisation of natural resources is vital for promoting sustainable development and safeguarding the welfare of present and future generations. How Malaysia employs and safeguards its natural resources has far-reaching consequences on the environment, economy and society. To successfully navigate the intricacies of resource management, the government must adhere to fundamental concepts and directives that prioritise sustainability, the well-being of ecosystems, engagement of stakeholders, integration of policies, adaptive strategies, enforcement mechanisms and disseminating knowledge and awareness (Affair, 2019).

Sustainability is at the core of responsible resource management. It strongly resonates with the United Nations' Sustainable Development Goals (SDGs) for 2030, a set of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all." It represents prioritising methods that carefully balance resource extraction with preservation to ensure sustained availability over the long term. The objective is to avert overexploitation and stimulate regeneration, enabling resources to flourish and remain accessible for future generations. Sustainable practices encompass a range of techniques, including selective harvesting, reforestation and responsible fishing, all aimed at upholding the vitality of ecosystems. Our resources are not isolated; they are integral components of intricate ecosystems that provide humanity with essential services. An ecosystem-centred approach recognises the complex interdependencies within these systems and the invaluable services they provide. Resource management within the broader context of ecosystem well-being and resilience sustains a delicate equilibrium that bolsters biodiversity, ensures water quality and facilitates climate regulation.

Stakeholders

The effective management of resources, especially in the context of Malaysian national security, demands the active involvement of a diverse range of stakeholders. This is essential not only for ensuring the sustainable use of resources but also for maintaining the security and stability of the nation. Engaging various groups is critical in Malaysia, where natural resources like oil, gas, timber, and fisheries are crucial to the economy and the environment. Local communities are often the first to experience the impacts of resource exploitation. Their involvement ensures that their needs and insights are considered, particularly those on traditional practices and sustainable living. This inclusion can lead to the preservation of ecosystems and the maintenance of biodiversity, which are vital for national security regarding food and resource stability.

Industries, including oil and gas, palm oil, rubber, and fisheries, are significant players in resource utilisation. Their participation in sustainable management is crucial for balancing economic growth with environmental preservation. By adopting sustainable practices, industries can reduce environmental damage, prevent resource depletion and ensure long-term economic security. Non-governmental organisations (NGOs) also advocate sustainable practices, often bridging the gap between local communities, industries, and the government. They bring attention to environmental issues and human rights, promoting policies that align with sustainable development goals. Their expertise in conservation and sustainable practices can guide the development of strategies that protect natural resources, thereby contributing to national security. Experts, including scientists, environmentalists, and policymakers, provide the necessary knowledge and evidence-based strategies for sustainable resource management. Their research and insights into global best practices and innovative technologies can help Malaysia address its unique challenges in resource management, align with international standards and contribute to the nation's security.

Incorporating these stakeholders into the decision-making process ensures a holistic approach to resource management. This approach is crucial for Malaysia as it navigates the complexities of balancing economic development with environmental conservation and national security. By fostering transparent communication and collaborative efforts, these diverse groups' collective wisdom and experience can be harnessed to make well-informed decisions. Such a strategy not only aids in sustainable resource management but also bolsters Malaysia's resilience against environmental, economic, and security challenges.

Effective Strategies for Sustainable Resource Management

To successfully strategise for sustainable resource management, the government must harmonise efforts across diverse sectors for effective and efficient resource management. Consolidating robust policies and fostering a collaborative approach creates synergy. This integrative method helps reduce conflicts and enhance positive environmental impacts, paving the way for a sustainable future. The dynamic nature of environmental conditions necessitates an adaptive approach to resource management. The government must continuously monitor resource conditions and be prepared to adjust management strategies in response to changing circumstances. This flexibility is crucial in addressing unforeseen environmental challenges ensuring the resilience and sustainability of resource management systems.

Developing robust regulatory frameworks is vital for ensuring adherence to resource management policies. Effective enforcement mechanisms are critical, including penalties for non-compliance and incentives for responsible resource use. These regulations act as a bulwark against illegal activities and promote responsible utilisation of resources.

However, these regulations must be accompanied by stringent enforcement measures to prevent exploitation and degradation of natural resources. Raising public and cultural awareness about the importance of sustainable resource management is also crucial. As Deschaht (2020) notes, educating individuals about biodiversity conservation, responsible resource use, and the impact of resource consumption on both local and global environments empowers them to make more informed choices.

Such heightened awareness can lead to conscientious consumer behaviour and bolster support for sustainable policies. Therefore, the effective management of natural resources is the foundation of sustainable development and the well-being of current and future generations. The government can navigate towards a more sustainable and prosperous future by adhering to sustainability principles, employing ecosystem-centered approaches, engaging stakeholders, integrating policies, adopting adaptive strategies, enforcing regulations, and disseminating knowledge. Our collective responsibility is to ensure the judicious and responsible stewardship of the planet's invaluable resources.

Conclusion

Natural resources are fundamental to economic development and environmental stability. With its rich resource tapestry spanning rainforests to oil and gas reserves, Malaysia stands at the pivotal juncture between harnessing resources for development and conservation imperatives. This wealth is a double-edged sword. While these resources significantly bolster the nation's economy, leveraging these without jeopardising their sustainability presents an overarching challenge. Maintaining a crucial equilibrium between economic growth and responsible resource use is paramount for safeguarding the well-being of many Malaysians.

The "resource curse" phenomenon highlights the perplexing situation wherein nations endowed with abundant natural resources, predominantly non-renewable, often grapple with stagnated economic progress, developmental lag and weakened institutional frameworks. Contrary to this prevalent notion, Malaysia has managed to chart a distinct course. Instead of relying solely on its abundant natural wealth, Malaysia has diversified its economic horizons, experiencing notable expansion in manufacturing and services. Furthermore, the nation's forward-thinking strategies, embodied by initiatives like the previous Vision 2020 and the Shared Prosperity Vision 2030, harmoniously dovetail with the overarching United Nations Sustainable Development Goals for 2030.

However, it would be remiss to overlook the challenges. Even as Malaysia adeptly navigates the complexities of the resource curse, it continues to confront multifaceted issues spanning environmental conservation, societal implications and governance linked to its resource bounty.

This journey provides invaluable insights into sustainable development strategies for resource-rich nations. It also underscores the unyielding need for vigilance and adaptive strategies to overcome emerging challenges effectively.

Author Note

The author declares no potential conflicts of interest concerning this article's research, authorship and publication.

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First Admiral Abdullah Sani bin Ismail

First Admiral Abdullah Sani bin Ismail was born in 1967 and commissioned as a Sub Lieutenant in the Executive Branch of the Royal Malaysian Navy in 1987. First Admiral Sani held various appointments throughout his career, such as the Commanding Officer of KD KELEWANG, Chief of Staff and acted as the Submarine Force Commander, Commanding Officer of KD LEKIR, the Squadron Leader of the 22nd Corvette Squadron, the Senior Officer of Afloat. He has attended Basic Submarine Course and Qualification Training at HMS PLATYPUS, Australia, where he received his Royal Australian Navy Submarine Qualification Badge (Dolphin). He also attended the GOTLANDS Class Submarine Familiarisation Training in Malmo, Sweden (1995) before joining a Staff Course at the Naval War College, United States of America, in 2002. He obtained his Royal Malaysian Navy Submarine Qualification badge (Dolphin) 2005. He also earned his Master's in National Security Administration (MNSA) from the National Defence College of the Philippines (NDCP). Before attending the National Resilience Course Cohort 4, he was appointed Commander of the Naval Diving and Mine Warfare.

The Statesman Journal
2023, Vol 1 98 - 111
ISSN-2811-454x

ACCELERATING THE DEVELOPMENT OF DEFENCE TECHNOLOGY AND INDUSTRY IN MALAYSIA

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Abstract

Countries worldwide are increasingly emphasising strengthening their security capabilities as geopolitical developments continue to evolve very rapidly. Malaysia, a strategically located Southeast Asian country overlooking the Straits of Malacca, is no exception. Recognising the importance of a strong defence industry to ensure national security, Malaysia has been actively pursuing accelerated development of its defence technology and industry to safeguard national sovereignty, secure vital sea lanes and be prepared to meet new security challenges. It can grow its economy and harness the spill-over effects of advanced technology into other industries such as aerospace, electronics and communications and cyber security that can contribute to economic transformation for the country's long-term prosperity and economic sustainability. This article examined several aspects of Malaysia's efforts. It provided an overview of the country's security technology and industry situation, clarified the complex rationale behind this strategic initiative, discussed the current challenges facing this initiative, and provided potential ways in which Malaysia's defence technology and industry could be strengthened capabilities. In doing so, Malaysia positions itself not only as the custodian of its sovereignty but also as an active participant in the evolving global security landscape, promoting economic growth, human capital development, and technological progress to ensure the sustainable prosperity of the nation.

Keywords: *Defence Technology, Defence Industry, Defence Strategy, Self-Reliance*

Introduction

Defence technology and industry refer to the sector of the country's economy that focuses on developing, producing and maintaining military equipment, technology and systems for national defence purposes. This sector plays an essential role in the country's ability to protect itself from external threats and maintain its sovereignty. It is clearly stated in The Malaysian Defence White Paper (2020) and National Defence Policy (2010) that the country shall have a robust and self-reliance in defence technology and industry for enhancing the overall capabilities of the Malaysian Armed Forces (MAF) (Ministry of Defence, 2020; Ministry of Defence, 2010).

The country's pursuit of the establishment and development of defence technology and industry can be characterised by two main reasons, which are political and economic factors (Bitzinger, 2013; Balakrishnan, 2008). The country has robust defence technology and industry capable of providing essential support that ensures a nation's survival during military conflicts and even during wars (Kinsella, 1998; Brauer, 1998).

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Researchers state that defence technology and industry play a strategic role by equipping armed forces with essential military equipment, weapons systems, and the technological foundation necessary for maintaining and advancing military capabilities (Bitzinger, 2013; Balakrishnan, 2008). By having competent defence technology and industry, countries can solve the security issue of the supply chain, particularly in mitigating weapons embargoes (Bitzinger, 2013). To some extent, countries like North Korea, Israel, India and Turkiye make it mandatory for their domestic defence technology and industries to produce specific military equipment for security and political motives, often regardless of economic costs.

Another aspect behind the push for defence technology and industry was economic considerations. Import-substitution policies have been identified as driving factors (Bitzinger, 2013; Balakrishnan, 2008). Moreover, defence technology and industry also employ local people and enhance human capital skills, especially in technologically oriented professions like engineers, scientists, and skilled technicians, contributing to the growth of expertise and human resource capabilities (Bitzinger, 2013).

However, the realisation of this goal remains distant, primarily due to many challenges obstructing the national ambitions. One of the main challenges is in terms of financial resources. Malaysia needs to allocate resources to meet the more pressing demands of sectors that hold higher priority, such as education and healthcare, which has resulted in defence funding being lowered to the fourth position within the national budget. In the last 50 years, commencing from the late 1960s, there has been notable growth in Malaysia's defence technology and industry. This growth has allegedly led to various economic benefits, including employing the locals, generating skilled workers, establishing value-added supply chains, and exporting manufactured goods and maintenance services (Ministry of Defence, 2020; Bitzinger, 2013).

Presently, the emphasis on attaining technological and industrial self-reliance focusing on the activities centred on modifications, upgrades, retrofits, maintenance, repair, and overhaul (MRO), as well as design and production of items in strategic niche areas, including vehicles, vessels, unmanned aerial system (UAS) and essential combat equipment (Balakrishnan, 2008). Despite these promising developments, the growth and performance of Malaysian defence technology and industry remain relatively modest. This is evidenced by the statistics of 90% of major defence assets being imported from overseas (Balakrishnan & Johar, 2021).

In this regard, the various aspects will be explored, including the overview of national defence technology and industry landscape, the importance behind the push, current challenges and potential strategies for enhancing defence technology and industry for national security.

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Current State of Defence Technology and Industry in Malaysia

Malaysia's defence technology and industry had humble beginnings post-independence, primarily focusing on the maintenance, repair, and overhaul (MRO) of military equipment, particularly in the Malaysian Army. The government established SME Ordnance Sdn—Bhd. in 1969 as a joint venture for producing ammunition, pyrotechnics, and small firearms. In 1975, the Aircraft Inspection, Repair, and Overhaul Depot (AIROD) were established to cater to aircraft repair and overhaul needs for the Royal Malaysian Air Force (RMAF). In 1984, the Royal Malaysian Navy (RMN) Dockyard was founded to maintain, repair, and overhaul RMN vessels. The privatisation of RMAF AIROD and RMN Dockyard occurred in the 1980s and 1990s. Regarding governance, the Defence Technical Centre (predecessor of STRIDE) and the Defence Industry Division (DID) were set up in 1968 and 1972, respectively. The former focused on developing defence technology and supporting the Malaysian Armed Forces (MAF) in procurement-related activities, while the latter monitored and directed defence industry development.

The National Defence Production Policy (NDPP) was introduced in 1982, outlining the production responsibilities for strategic defence assets by government-owned entities and essential and non-strategic defence items by semi-government and private sector companies (Balakrishnan & Matthews, 2009). Economic challenges in the mid-1980s led to reduced defence spending, impacting NDPP initiatives in sectors like defence, automotive, aerospace, and maritime. Consequently, the MAF focused on asset life extension programs due to budget constraints, resulting in a limited development of defence technology and industry capabilities, primarily focused on MRO activities and basic soldier needs. The assembly of defence assets within the country remained minimal despite cooperation with licensed manufacturing companies (Balakrishnan & Matthews, 2009).

As reported by (Abdullah and Zahari, 2023), in the 1990s, Malaysia's defence technology and industry regained momentum after being stalled by an economic recession. The Prime Minister increased the defence budget and reinitiated the PERISTA program, which had been paused. High-security needs led to increased weapon acquisitions from abroad, driving defence technology and industry activities, especially in Malaysia's MRO (Balakrishnan, 2008). Defence technology and industry development in 1990 - 2000 is the highest in Malaysian history. This prompted large public companies such as DRB-HICOM and Sapura to diversify their business by entering the defence technology and industry sector (Abdullah & Zahari, 2023). Large publicly listed companies have the necessary resources, know-how, and infrastructure to research and produce defence equipment and services for the Malaysian Armed Forces (MAF). The dual-use industry approach allows for the development of defence equipment alongside commercial industrial facilities, making it economically viable in sectors like automotive and aerospace, benefiting the nation in the long run (Balakrishnan, 2008).

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To enhance the governance of defence technology and industry, the Ministry of Defence formed the Malaysian Defence Industry Council (MDIC) in 1999 to coordinate the development of Malaysia's defence technology and industry sector. The Minister of Defence chairs the council, including various government agencies, semi-government, and defence industry companies. The focus of MDIC is to plan the development of the defence industry based on the objectives and interests set by the government and has focused significantly on a few sectors: common user items, ordnance and weapons, vehicles, aerospace, maritime and ICT.

The council convenes biannually to address industry-related issues and has formulated policies like offset policies, long-term contracts, and the national defence industry blueprint. To boost the local defence industry further, it expanded its scope to encompass enforcement and security sectors, renaming it the Malaysian Industry Council for Defence Enforcement and Security (MIDES) in 2010. As of September 12, 2023, 107 local companies were registered with MIDES (Defence Industry Division, Malaysia, 2023).

From the 2000s onwards, the national defence technology and industry was not only focused on MRO activities and the basic needs of soldiers but has grown indigenous products in ICT, automotive, maritime and aerospace sectors. These changes have ignited economic growth, encouraged the adoption of emerging local technologies, and elevated operational efficiency within the industry. Moreover, the progress of the national defence technology and industry sector can energise and positively influence a range of other sectors, such as electronics, raw materials, oil and gas, logistics service providers, and the automotive industry.

Furthermore, introducing diversity within the defence technology and industry can promote information sharing, reinforce domestic research and development efforts, and address issues related to the nation’s military assets (Abdullah & Zahari, 2023). The MOD has taken significant steps to advance the defence technology and industry in Malaysia by transforming the Defence Science & Technology Centre (DSTC) into the Science & Technology Research Institute for Defence (STRIDE) in 2001 with an expanded workforce of 300 personnel, responsible for coordinating, managing, and conducting defence R&D as well as providing scientific and technical support to the MAF. The institute is crucial in evaluating and testing systems and equipment to ensure their suitability for MAF operations.

Moreover, it actively contributes to enhancing the capabilities of the local defence industry. STRIDE collaborates with industry and academia on R&D programs, resulting in notable achievements like the development and deployment of Malaysia’s first domestically produced Unmanned Aerial System (UAS) called “ALUDRA” in 2007, which played a crucial role in supporting MAF operations in Eastern Sabah until 2012.

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Additionally, STRIDE contributed to developing a digital camouflage pattern used by the Malaysian Army since 2013. Academic institutions also play a vital role in advancing defence R&D. The transformation of the Malaysian Armed Forces Academy into the National Defence University Malaysia (NDUM) in 2006 has strengthened defence technology and industry through research, development, and collaboration between government, academia, and the defence sector towards country self-reliance.

Currently, various efforts are being taken by the government, especially under the Ministry of Defence, to enhance the national defence technology and industry capabilities. The government will launch the National Defence Industry Policy (NDIP) before the end of 2023 to provide a comprehensive direction in reducing dependence on assets and equipment from abroad, hence improving the self-reliance of the country's defence. The launch of the NDIP is expected to bring positive changes to the defence technology and industry in Malaysia and to strengthen the industry, provide job opportunities, generate returns for the country and, most importantly, give a confident assurance of self-reliance to our defence and protect Malaysia sovereignty.

Importance of Accelerating Development of Defence Technology and Industry

According to various scholars (Bitzinger, 2013; Balakrishnan, 2008; Kinsella, 1998; Brauer, 1998), the establishment and development of defence technology and industry within countries are driven by both economic and political factors. Accelerating defence technology and industry development is critical in strengthening national defence capabilities. Innovation and advanced technologies are essential in today's rapidly evolving global security landscape. A nation can gain a strategic advantage by investing in R&D and collaboration within the defence sector. Advanced defence technologies enhance situational awareness, improve communication, and provide cutting-edge weaponry and protective systems.

Furthermore, robust domestic defence technology and industry reduce dependence on foreign suppliers, ensuring a nation's security interests are safeguarded even during international tensions or supply disruptions due to military conflicts or during the pandemic. Fundamentally, prioritising defence technology and industry development reinforces a nation's ability to deter threats, respond effectively, and protect its citizens, making it a fundamental component of modern national defence strategies. Accelerating defence technology and industry development enhances national security and stimulates economic growth and job creation. Investment in defence technologies leads to research and development advancements that often have civilian applications, spurring innovation across various sectors.

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The defence technology and industry provide substantial employment opportunities, from engineers and scientists to skilled labourers and administrative staff. As this sector expands, it generates a ripple effect throughout the economy, creating jobs in support industries like manufacturing, logistics, and services. Moreover, exports of defence products and technologies can significantly contribute to a nation's trade balance, boosting overall economic prosperity.

Moreover, this will reduce a nation's dependency on foreign defence technology imports. Relying heavily on external sources for critical defence equipment and systems can compromise national security during conflict or geopolitical instability. By fostering a robust domestic defence industry, a nation gains self-reliance, reducing vulnerabilities associated with supply chain disruptions, export restrictions, or political pressures from foreign suppliers. This autonomy ensures that a country's armed forces have timely access to cutting-edge technologies, decreasing the risk of strategic disadvantages.

A strong defence technology and industry sector can significantly enhance a country's regional influence. It demonstrates a nation's military capabilities, establishing it as a regional security partner. This can lead to alliances and partnerships, increasing diplomatic leverage. Additionally, the defence industry often involves exports, contributing to economic growth and making a country an attractive trade partner. Collaborative defence projects with neighbouring nations foster trust and cooperation, further boosting regional influence. In summary, a robust defence technology and industry sector ensures national security and elevates a country's standing in the region, facilitating diplomatic relationships, economic partnerships, and greater influence on regional affairs.

Challenges in Accelerating Development of Defence Technology and Industry

Despite the many advances achieved by the country's defence technology and industry since the 1970s, national defence still depends on defence equipment and technology from abroad. The government still faces several obstacles that have not been resolved well. Among the main problems is the weakness in the governance of the defence technology and industry ecosystem, especially from the aspect of defence equipment acquisition, defence R&D and defence production, which do not clearly outline that the acquisition of defence equipment shall be made through local defence technology and industry has resulted in almost all defence assets being imported from abroad. Weaknesses in the planning and management of various departments under the MOD have a significant impact on the failure to transfer knowledge and methods in mastering technology and defence R&D. Ineffective management and a lack of clear guidance in the R&D program result in the executed R&D projects falling short of meeting the MAF's needs. Furthermore, Malaysia lacks comprehensive defence technology, and industry laws are similar to those of countries like Turkiye, South Korea, and Indonesia (Awang Sa, 2019).

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For comparison, the table presented below, Table 1, outlines the defence technology and industry laws in several countries.

Table 1: Defence Technology and Industry Law in Several Different Countries

Country	Defence Technology & Industry Law
Singapore	Defence Science and Technology Agency Act 2000
Australia	Defence 2000
South Korea	The Agency for Defence Development Act, Defence Industry Development and Support Act, Defence Acquisition Program Act
Turkiye	Defence Industry Development and Support Administration Office 1985 (Law No. 3238)
Indonesia	Defence Industry Law 2012 (Law No. 16, 2012)
Malaysia	None

The advancement of defence technology and industry demands significant financial commitments, and the Malaysian government faces the difficult task of balancing these investments and other national priorities. According to findings by (Wan Hanafi, 2021), a key challenge lies in the need for dedicated funds allocated explicitly to defence technology and industry. Historically, R&D activities were undertaken by STRIDE, utilising Development Expenditure (DE), which is highly regulated and primarily intended for the procurement and development of capital items (OS35000), thus limiting its applicability to other expenses. A comparison of the STRIDE's R&D budget for each Malaysia Plan can be found in Table 2 for reference.

STRIDE, responsible for being the defence R&D leader, is only allocated a relatively small amount of funding per year for research. This limited financial support does not allow STRIDE to explore the various priority areas of defence technology in the National Defence Policy and Defence White Paper. This value is notably smaller than the financial allocation obtained by the same regional agency, illustrated in Table 3 for reference.

Table 3: Comparison of Defence R&D Budget

Malaysia Plan	8th	9th	10th	11th	12th
Years	2001-2005	2006-2010	2011-2015	2016-2020	2021-2025
R&D budget (RM Mil)	2.2	17.5	9.8	96	80

One of the reasons why Malaysia was left behind in the aspect of defence technology and industry was due to the shortage of defence R&D personnel, especially in STRIDE, which is the leader in defence R&D for the advancement of defence technology and industry in the country, according to (Wan Hanafi, 2019).

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STRIDE currently only has 300 employees, significantly lower than similar organisations abroad. Table 4 compares the number of employees in selected defence technology and industry agencies worldwide.

Table 4: Number of Employees of Defence Technology and Industry Agency for Selected Countries

AGENCY	YEARLY R&D BUDGET (Million RM)
DSTA & DSO, Singapore	2000
DSTO, Australia	1600
DSTL, UK	1600
DTI, Thailand	154
STRIDE, Malaysia	16

The Malaysian defence technology and industry face a critical challenge – the lack of collaboration among key stakeholders. In today's dynamic global security landscape, fostering a united and cooperative defence sector is paramount. However, several factors hinder the realisation of this collaborative potential. Competition is a significant issue, with Malaysian defence firms often competing for contracts, resources, and recognition. This competitive environment discourages pooling expertise and resources for collective benefit.

Additionally, Malaysia's defence industry is fragmented, primarily comprising small and medium-sized enterprises (SMEs) that may lack the scale and capability for effective collaboration. Security concerns add another layer of complexity, as the classified nature of defence work makes companies wary of sharing proprietary data and technologies with potential competitors. Bureaucratic hurdles and limited communication channels further impede collaboration. The Malaysian government and industry leaders must collaborate to streamline regulations and establish secure information-sharing platforms to address these challenges. The absence of cooperation among Malaysian defence technology and industry stakeholders presents significant hurdles at a time when collective efforts and innovative solutions are crucial for national security. Overcoming these barriers requires a joint effort to create a collaborative-friendly environment, ensuring Malaysia's defence industry remains competitive and adaptable in a rapidly changing world.

In Malaysia, various departments and divisions are involved in the defence procurement, technology, and industry ecosystems. It has been observed that there are some areas for improvement in coordination and management concerning the relevant departments and divisions. Weaknesses in the planning and management of various departments and sections significantly impact the failure to transfer knowledge and methods in mastering defence technology and industry.

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Although the implementation of the ICP program (offset program) for the transfer of technology during the purchase of new defence equipment has been implemented, it seems to be less effective, and this situation is shown by the ability of the country's technology and defence industry is still low. Likewise, existing regulations do not address the required technology transfer methods and their priorities.

The acquisition of defence equipment is only to meet the needs of the MAF without being allowed to master the technology to produce the defence assets themselves in the country. Malaysia needs a comprehensive defence equipment certification framework. This absence of a formalised certification system for defence products can pose challenges in ensuring the quality, safety, and performance of military hardware and technology used by the Malaysian Armed Forces (MAF) and the export market since obtaining certification from overseas laboratories is very expensive.

With a structured certification process, there may be certainty regarding the reliability and suitability of defence equipment. This can potentially impact the safety of military personnel and civilians and the effectiveness of MAF operations. Malaysia must establish a robust defence equipment certification system to address this gap. Such a system would involve defining and implementing stringent standards, testing procedures, and evaluation criteria to ensure that defence products meet the required specifications and adhere to international norms. This would enhance national security and bolster Malaysia's defence industry's credibility on the global stage, facilitate international collaboration with allied forces, and boost the export of defence equipment.

Strategies for Acceleration Development of Defence Technology and Industry

Addressing the challenges of low defence self-reliance requires a comprehensive examination of the defence technology and industry ecosystem. A precise defence technology and industry governance need to be strengthened with the enactment of the Defence Technology and Industry Act in the near future, which states matters related to defence technology and industry in the country. An Executive Council for Defence Acquisition, Technology and Industry shall be established. It is suggested that the Minister of Defence chair this council.

The function and role of the council is to determine the direction of defence technology and the industry towards self-reliance, determine the R&D program that needs to be implemented to support the defence industry, as to examine and approve the use of the Defence Technology and Industry Fund. Figure 1 illustrates the Defence Technology and Industry Ecosystem Governance Framework.

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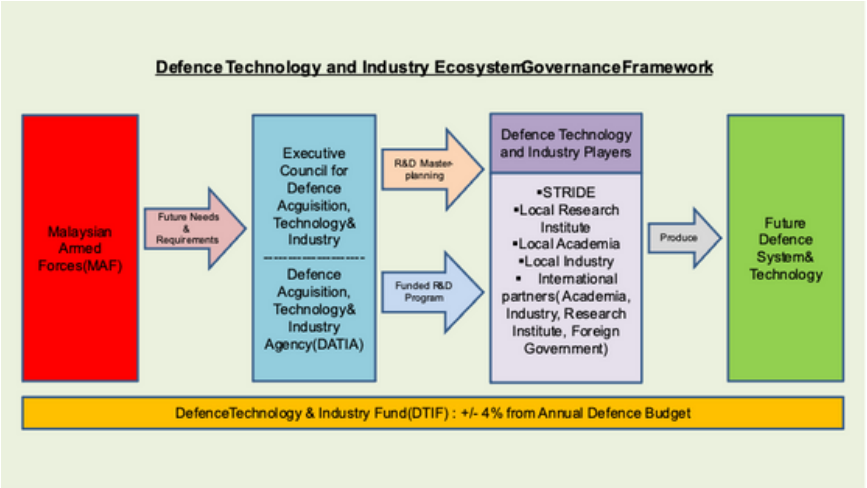

Figure 1: Defence Technology and Industry Ecosystem Governance Framework

To further strengthen the defence technology and industry ecosystem, it is recommended to consolidate and enhance STRIDE, Defence Industry Division and Procurement Division into a unified entity known as the Defence Acquisition, Technical and Industry Agency (DATIA). The role of DATIA shall be as follows: a) to implement the decisions of the Executive Council for Defence Acquisition, Technology & Industry; b) to implement comprehensive planning for the development and production of local defence products and industries; c) to plan and implement policies and plans for collaboration with local technology and industry agencies; d) to manage Defence Technology & Industry Fund; e) to carry out procurement of large and complex defence equipment; f) to manage the defence offset program. The Executive Council will decide which defence equipment to produce in the country based on the following model in Figure 2.

Figure 2: Defence Equipment Acquisition Model Priorities

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Concerning the shortage of defence researchers in Malaysia, especially in the STRIDE, which currently only has 300 employees, significantly fewer than similar organisations in other countries. It is recommended that the number of researchers in STRIDE be increased gradually to be on par with similar agencies in neighbouring countries. The MOD also shall take the necessary steps to establish a dedicated defence technology and industry fund provision of specific financial allocations for research developing local defence equipment. The same goes for research activities for self-maintenance of defence assets.

The National Defence Policy (Ministry of Defence, 2010) emphasises strengthening strategic cooperation both domestically and abroad to improve national defence R&D capabilities through the exchange and sharing of information and, knowledge and technology is a mechanism that can accelerate progress, reduce costs and R&D risks. R&D cooperation with foreign countries fosters the spirit of friendship between Malaysia and other countries. The Defence Diplomacy Platform can be used to draft bilateral cooperation with foreign countries to obtain the transfer of high technology that is much needed and as access for the commercialisation of defence products abroad.

For in-country strategic collaboration, the concept of The “Whole of Government, Whole of Society” approach in the Defence White Paper can be used to mobilise defence R&D. STRIDE, as the leader of defence R&D in Malaysia, needs to take an approach by establishing strategic collaboration with various parties in the country including the ATM itself as a user, the university which has many scientists and the defence industry which has manufacturing facilities capable of optimising expertise, use of the equipment and also funding sources to achieve the goals and objectives of R&D that were designed. The defence product incubator program at STRIDE can be established as a platform for such R&D collaboration.

Another aspect to be explored is using ICP for R&D projects for indigenous defence products. The ICP program managed by the DID should boost the production of defence products through local R&D with the help of established defence industries in other countries to help Malaysia access advanced technologies while tailoring them to local needs. The Defence White Paper (Ministry of Defence, 2020) stated that 30% of the ICP value is focused on R&D programs. Leveraging offset programs for R&D projects related to indigenous defence products can help countries develop cutting-edge technologies, enhance national security capabilities, and stimulate economic growth in the defence sector. Effective project management, collaboration, and regulation adherence are crucial to success. Enhancing human capital and talent development is critical for advancing defence technology and industry. A proficient workforce drives innovation in defence research and development, engineering, and manufacturing.

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Investments in education, training, and research programs are fundamental in nurturing such capabilities and fostering collaboration among academia, government, and defence companies. This collaboration creates a dynamic environment for technological progress and attracts top talent to the defence sector, which is essential for sustaining innovation. Furthermore, several key strategies can strengthen human capital in this sector. Education plays a critical role, with governments and industry leaders channelling resources to improve STEM education, beginning at the school level and extending into higher education.

Scholarships and incentives can incentivise students to pursue defence-related careers. Continuous training and development programs are crucial, transferring expertise to new talent and ensuring adaptability to evolving technologies. Career advancement pathways should be clear to retain skilled professionals. Governments should offer incentives, grants, and tax benefits to defence technology and industry firms investing in human capital, reducing financial burdens and promoting national security, economic growth, and global competitiveness. As for STRIDE, gradual increments are proposed to be made to its workforce to align it with similar agencies in neighbouring countries.

For certification of R&D products and imported defence assets, it is suggested that MOD enact relevant regulations or acts and establish a Defence Product Certification Division at STRIDE to test and issue Defence Product Quality Certification Certificates that meet the characteristics specifications set by the MAF in terms of capacity and durability comparable to existing equipment in the international market. In this way, it can give MAF confidence in using qualified local defence products and exporting them to the world market. Exporting these technologies and products, therefore, is not solely a financial effort; it is a means of sharing expertise, strengthening diplomatic ties, and promoting technological recognition on the global stage. By offering advanced defence solutions, a nation fortifies its security and plays a crucial role in shaping the defence landscape worldwide, contributing to international stability and economic prosperity.

Focus Area of Defence Technology and Industry

The Defence White Paper (Ministry of Defence, 2020) outlines that the Malaysian government plans to invest in national defence technology and industry by stimulating research and development across critical technology sectors. Emphasis will be given to self-reliance on selected niche areas, including the provision of essential assets, equipment and services such as basic combat equipment soldiers, like small arms, ammunition, communication systems, bulletproof vests, webbings, ballistic helmets, combat dress and rations and MRO of main assets and equipment for the MAF.

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Elements of Industry 4.0, such as artificial intelligence technologies, shall be used by key defence industry players to keep pace with other military asset requirements, such as unmanned systems and smart weapons. The government's aspiration is for the MAF and security agencies to coordinate assets and equipment procurements to achieve a certain level of commonality among the MAF and security agencies. Such common assets include patrol boats, small arms and ammunition, helicopters, trucks, communication equipment and computerised systems. As for STRIDE, it shall coordinate all R&D activities in various defence-related areas, including artificial intelligence, unmanned systems, smart weapons and ammunition, radars and sensors, and more.

Conclusion

The acceleration of defence technology and industry development in Malaysia is a comprehensive effort connecting with national security, economic growth, and technological advancement. As the nation navigates geopolitical challenges and seeks to maintain its sovereignty, enhancing the governance, strategic investments, strengthening human capital and talent development, collaborative efforts, and a forward-looking approach will be critical. By overcoming challenges and embracing opportunities, Malaysia can achieve a well-balanced defence sector that safeguards its interests while contributing to its overall progress on the global stage.

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The Statesman Journal
2023, Vol 1 113 - 123
ISSN-2811-454x

COMBATING CLIMATIC CHANGE IN MALAYSIA: HOW CLIMATIC CHANGE AFFECTS WATER RESOURCES AND AGRICULTURE

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Abstract

C*limate change in Malaysia is a reality that has shifted from being predominantly an East Coast concern to affecting previously unimpacted West Coast states like Selangor and Perak. The study defines climate change as a significant alteration in climate patterns over time attributable to natural variability or human activity. It examines its multifaceted impact across land, water, air, and sea in Malaysia. Key environmental challenges include the loss of ecological resilience due to urban and industrial expansion, increased demand for water in agriculture and other sectors, contamination and overuse of groundwater, recurrent haze from regional land fires, pollution transport, acid rain, and the degradation of coastal ecosystems. This paper focuses particularly on water resource issues and the agricultural repercussions of climate change, exploring the complex interplay between pollution, water scarcity, drought, and flood conditions caused by global warming and seasonal shifts. Furthermore, the study evaluates Malaysia's challenges in combating climate change, emphasising the need for heightened awareness and stronger enforcement measures. It scrutinises the effectiveness of the National Policy on Climate Change and the government's broader strategies, offering findings and recommendations to bolster policy and action plans to mitigate the adverse effects of climate change in Malaysia. These recommendations are supported by various governmental documents and literature, underlining the need for enhanced, comprehensive approaches to address this pressing issue.*

Keywords: *Climate change, Malaysia National Policy on Climate Change, food security, water resources, flood, drought, agricultural.*

Introduction

This paper presents a critical analysis of the effects of climate change in Malaysia, exemplified by the irregular rainfall and major floods affecting eight states on December 16, 2021. This event serves as a stark reminder of the reality of climate change, which has increasingly impacted numerous states in Malaysia. A notable shift has occurred since the late 1990s when floods were primarily confined to the Peninsula's East Coast. However, the phenomenon has recently expanded to affect the West Coast States, including Selangor and Perak, regions previously untouched by such events. This indicates a profound change in environmental security considerations across various sectors. Defined by the United Nations Framework Convention on Climate Change (UNFCC, 2016) as any significant alteration in climate patterns due to natural or human factors, climate change has far-reaching security implications. For instance, rising temperatures due to ozone depletion and other pollutants have led to global warming, adversely affecting agriculture and water resources.

Additionally, unpredictable rainfall patterns, resulting in floods, contrast with these higher temperatures, illustrating the diverse impacts of climate change. Malaysia faces many environmental challenges across its land, water, air, and sea domains. The interplay of climate change and development has eroded ecological resilience. Industrial and land development pursuits have overshadowed agricultural priorities, leading to significant environmental degradation.

Water resources are increasingly compromised due to pollution, contamination of groundwater, and decreased river flow. Air quality concerns stem from recurrent regional haze, transportation pollution, and the release of hazardous materials. Moreover, marine pollution, primarily from shipping activities and the deterioration of coastal ecosystems like mangroves and coral reefs, further exacerbates environmental issues.

This paper aims to analyse and evaluate the multifaceted impact of climate change in Malaysia. It will explore the environmental problems caused by climate change, mainly focusing on its effects on water resources and agriculture. The analysis extends to examining governmental actions and efforts and proposing recommendations to combat climate change, especially concerning water resources. Additionally, this paper will delve into the broader consequences of climate change, providing an in-depth examination of related subjects and topics.

Issues and Challenges in Malaysia

This paper addresses the critical impact of climate change on Malaysia, a country located on the equator line, and its significant effects on agricultural production, water resource availability, and lifestyle changes. Over recent decades, air, water, and soil pollution has reached critical levels, impacting various sectors such as the environment, economy, and socio-cultural aspects of Malaysian life. Haliza (2018) notes that despite traditionally mild disaster occurrences, Malaysia has seen increased climate change-related events over the past decade, significantly affecting its people and necessitating government action.

Water resource issues have become increasingly prominent in Malaysia. Freshwater availability is declining, exacerbated by pollution from domestic and industrial waste, sewage, and river mismanagement. The Economic Planning Unit (EPU, 2022) highlights these challenges, attributed to industrial waste, river pollution, and insufficient water reservoirs, compounded by reduced rainfall amounts due to climate change. Floods, another consequence of climate change, not only pollute water resources but also damage crop plantations and disrupt economic activities, requiring financial aid for affected populations and damaged properties, including public facilities.

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Agriculturally, climate change poses significant threats to food security. Issues like inadequate soil for agriculture, crop damage due to floods or droughts, and water scarcity directly impact economic development and increase dependence on imported goods and food. Hilary Kung (2021) points out the impact of global warming on agriculture and forestry, driven by a reduction in green zones and decreased ozone levels, leading to higher temperatures. Malaysia, traditionally experiencing average temperatures of 27-30 degrees Celsius, now faces peaks of 36 degrees, causing challenges such as droughts and floods.

However, the challenges extend beyond environmental impact. The primary issue for Malaysia, including its government and agencies, is raising public awareness about climate change. Despite various policies and mitigation plans, general public concern still needs to be addressed. The Ministry of Science, Technology, and Environment (2000) emphasizes that climate change mitigation is a collective effort. Additionally, enforcement of policies is a significant challenge, with corruption identified by Ibrahim Komoo (2020) as a major obstacle. For instance, the 2019 Kim Kim River Pollution incident highlights the consequences of weak enforcement and corruption, leading to severe water and air pollution and health hazards in Pasir Gudang. Thus, effective policy implementation against climate change requires strict enforcement, corruption prevention, and a broad-based effort to embed climate change awareness among the populace.

Analysis of Climatic Change in Malaysia

The analysis delves into the impacts of climate change in Malaysia, starting with examining the environmental issues it has engendered. Malaysia has notably faced significant flooding and a shift in weather patterns across various states, indicative of the evolving nature of climate change. The year 2021 stood out for its natural disasters linked to these changes. As highlighted by Mazrura et al. (2022), the most evident effects of climate change globally and in Malaysia are extreme weather conditions like heat waves and heavy rainstorms. In Malaysia, these climatic extremes have had a dual impact: intense heat waves jeopardize agricultural output and food security, while heavy rainfall leads to flooding, endangering lives and damaging infrastructure.

Natural disaster

The increasing frequency and severity of weather extremes like floods and heatwaves signal a rise in destructive natural disasters. According to the UNFCC (2016), such conditions contaminate food supplies and create breeding grounds for disease-bearing insects, exacerbating health risks. Mazrura et al. (2022) note that rising sea levels and temperatures in Malaysia contribute to more frequent floods, exacerbating food and water shortages. Furthermore, droughts and floods are linked to heightened water pollution and increased pesticide presence in food.

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Beyond flooding, Malaysia faces the imminent threat of haze and air pollution due to climate change. A report by The Star (2022) indicates a significant increase in temperatures across Peninsular Malaysia, Sabah, and Sarawak from 1970 to 2013, with surface mean temperatures rising by 0.14-0.25°C per decade. Maximum and minimum surface temperatures also showed a marked increase. This trend of rising temperatures exacerbates health problems, impacts agricultural productivity, and alters the living conditions of Malaysians.

The finding aligns with the analysis conducted by the Ministry of Science, Technology, and Environment (2000), which indicates that global warming has led to rising sea levels, increased evaporation rates, and higher humidity. The report notes that sea levels have risen between 13cm and 94cm over the past century, necessitating ongoing monitoring efforts by the government. Figure 1 in the document presents a projected climate change scenario for Malaysia, updated every 20 years, to illustrate these evolving environmental conditions.

Northern Hemisphere Summer			
Year	*2020*	*2040*	*2060*
Changes in Temperature Changes in Rainfall	+0.3 to +1.4°C −0.4 to +14%	+0.4 to +2.4°C −0.7 to +23%	+0.6 to +3.4°C −1.0 to +32.0%
Northern Hemisphere Winter			
Changes in Temperature Changes in Rainfall	+0.4 to +1.9°C −4.0 to +7.0%	+0.7 to +3.2°C −7.0 to +12.0%	+1.0 to +4.5°C −10.0 to +17.0%

Figure 1: Climate Change Scenario for Malaysia
Source: Ministry of Science, Technology and Environment (2000)

Impact towards water resources

The analysis narrows its focus to the environmental issues caused by climate change, particularly in water resources and agriculture. The Prime Minister's Office of Malaysia (PMO, 2020) highlights the importance of water resources, emphasising the need to preserve water resources against threats like reduction, diversion, or wastage. This underscores the significance of water in various sectors, especially the economy. Sovacool (2014) points out that the primary use of water resources is in agriculture, requiring substantial quantities of water. Hydropower is identified as the second major consumer of water resources. The energy sector's use and contamination of water impose costs not only on households and commercial users but also extend to farmers and industries reliant on fisheries or marine mammals. Thermoelectric power plants, dependent on water from rivers, lakes, or streams for cooling, also contribute to water loss through evaporation.

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The impact of climate change on water resources becomes evident when considering extreme weather events. Heavy rainfall, while providing abundant water, can lead to contamination and waterborne diseases like malaria and diarrhoea, as outlined by the UNFCC (2014). Conversely, heatwaves or global warming can significantly diminish water supplies due to reduced rainfall and intensity, affecting the ability to meet water demands and requirements. The Economic Planning Unit (EPU, 2020) emphasizes the critical need for water resources in urbanization, particularly for industrial use and production. In summary, the preservation and sustainable management of water resources are paramount, requiring ongoing and concerted efforts by the Government of Malaysia to address the multifaceted challenges of climate change.

Impact on agriculture

Climate change has significantly altered the agricultural landscape, affecting every aspect of farming, including availability, accessibility, utilization, and stability, as per the Economic Planning Unit (EPU, 2022). Rising sea levels, leading to floods, can damage crops and disrupt food production. Climate factors such as rainfall, sunshine duration, temperature, humidity, and drought periods play crucial roles in determining crop performance, making understanding climate change essential for managing agricultural productivity.

The Ministry of Science, Technology, and Environment (2000) identifies climate change as a significant threat to national food security and the earnings from plantation crops, which are vital to the nation's economy. Unfavorable climatic conditions can adversely affect crops, animal husbandry, and aquaculture. Key economic crops like oil palm, rubber, cocoa, and rice are prioritised, with others needing more focus. Moreover, the government of Malaysia also places importance on animal husbandry, vegetable and floriculture production, and aquaculture, acknowledging their role in the agricultural sector and the need for adaptation strategies in the face of climatic changes.

Malaysia Mitigating Efforts

Addressing the multifaceted challenges posed by climate change is a critical responsibility of the government. Establishing effective and adequate measures to manage the impacts is imperative, particularly in water resources and agriculture. Given the significant effects of climate change on Malaysia's interests, the government must develop and implement policies and measures to mitigate these issues. As highlighted by UKM (2010), climate change policy is crucial due to its cross-sectoral nature, affecting not only environmental issues but also economic growth and human well-being. This necessitates a comprehensive approach that involves all levels of governance, sectors, stakeholders, and significant groups.

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Effective climate change measures must be integrated into broader development plans. This can be achieved through coordinated development efforts involving all relevant agencies and fostering widespread awareness of the effects of climate change.

Overview of Malaysia's National Policy on Climate Change

Through the Ministry of Natural Resources and Environment, the Malaysian Government has established the National Policy on Climate Change (2010). This policy ensures climate-resilient development that aligns with the nation's sustainability aspirations. It highlights the government's commitment to sustainability, emphasising the necessity to overcome resistance and challenges to ensure continued development. The policy emphasises that addressing climate change is the government's responsibility and a collective effort involving all agencies, the public, and stakeholders. It acknowledges the widespread impacts of climate change, stressing the importance of mitigating threats to human well-being, the sustainability of natural resources like food, water, and energy, and the broader implications for national development and security.

Figure 2 summarises the Malaysia National Policy on Climate Change in the document, outlining its objectives, principles, and strategies. This summary offers a comprehensive view of the policy, serving as a valuable reference for this study and understanding Malaysia's approach to combating climate change.

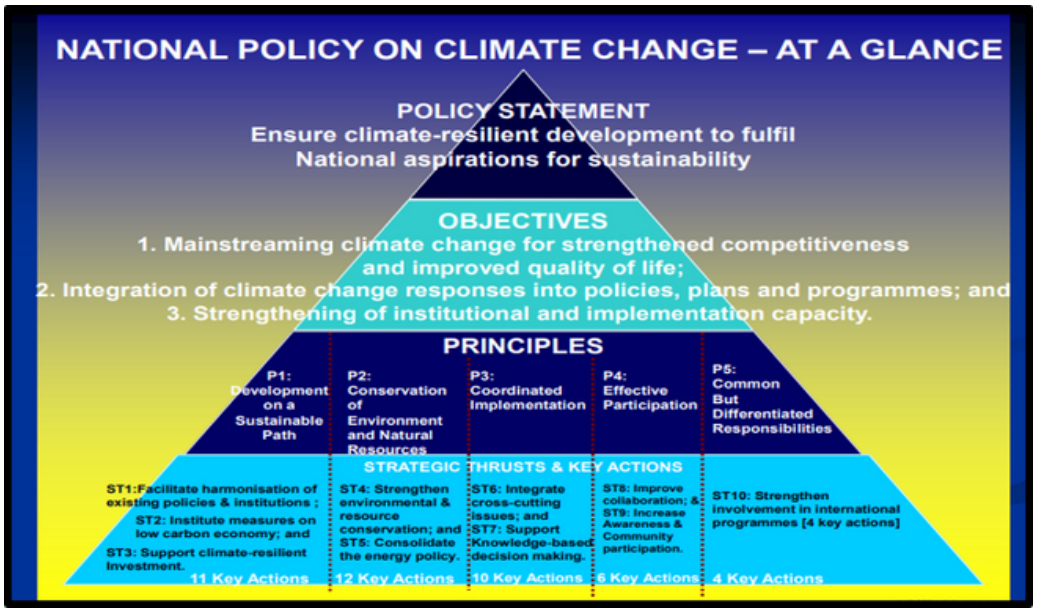

Figure 2: Summary of National Policy on Climate Change of Malaysia
Source: UKM (2010)

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The Malaysian government's strategic response to the impacts of climate change focuses on bolstering the country's resilience. This involves mainstreaming climate change considerations into policy and planning, balancing adaptation measures with mitigation responses, and enhancing institutional capabilities through coordinated actions. Five fundamental principles underpin these efforts: Development on a sustainable path, conservation of environment and natural resources, coordinated implementation, effective participation, and common but differentiated responsibilities and respectful capabilities. These principles are designed to address and mitigate the adverse effects of climate change in Malaysia. Integrating these principles into national development plans is critical to preserving the environment and natural resources. This approach focuses on mitigating the effects of climate change and adapting to its impacts, ensuring a balanced and comprehensive response. As outlined by UKM (2010), awareness of climate change issues is pivotal to the success of these strategies. Continuous effort and vigilance are required due to the unpredictable nature of climate change threats. All agencies must consistently maintain high awareness and incorporate climate change considerations into their plans and actions.

Effective and adequate measures of water resources and agriculture

The National Policy on Climate Change emphasizes the critical importance of water resources and agriculture, recognizing that the adverse effects of climate change can disrupt societal well-being and security. The policy, particularly under the Principle on Conservation of Environment and Natural Resources outlined by the Ministry of Natural Resources and Environment Malaysia (2010), underscores the need to preserve natural resources, specifically water. It mandates systematic reviews of water resources management through legislation, requiring any developmental modifications to receive authorization from relevant ministries or agencies. Priority is given to protecting essential water resources like dams, rivers, and man-made reservoirs.

Key actions within the policy promote sustainable lifestyles and incentivize efforts to conserve water resources, encouraging public cooperation and contribution. Additionally, the policy addresses climate change adaptation and disaster risk reduction, focusing on developing methods for assessing vulnerabilities and reducing risks from climatic hazards such as sea-level rise, flooding, and other extreme conditions. Regarding agriculture and food security, the policy reflects the UNFCC's 2014 findings that climate change is expected to affect all dimensions of food security: availability, accessibility, utilization, and stability of food systems. Variable rainfall and rising temperatures could lead to decreased crop yields due to increased crop failures and new pest patterns. This necessitates modifications in consumption patterns, adoption of sustainable agricultural practices, and new livelihood strategies.

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The policy's Principle of Development of a Sustainable Path prioritises agricultural and food security. It advocates for balanced adaptation and mitigation measures to ensure a continuous food supply, even in climate change. For instance, the government has implemented measures to sustain rice production under varying conditions, such as developing non-flooded and dry land rice ecosystems to maintain rice sufficiency levels. These measures are supported by broader mitigation efforts to strengthen environmental conservation and promote the sustainability of natural resources, thereby enhancing agricultural resilience and ensuring a stable food supply under varying climatic conditions.

Findings

The responsibility to combat climate change, particularly in water resources and agriculture, falls on everyone, encompassing agencies, individuals, and the government. Adaptive strategies in water resources management, both reactive and anticipatory, are crucial to prepare for and address climate-related issues. In agriculture, which is integral to food security, sustainable practices ensure the nation's resilience and provision for its needs. The Malaysian government has played a pivotal role in mobilizing and encouraging citizens to join the effort against climate change, fostering a sense of collective responsibility and continuous engagement.

In addition to the effective adaptation practices identified, this study also suggests the need for further research in related fields. The interconnectedness of climate change with security issues warrants an exploration of its impact on strategic studies and national security. This expanded focus could aid policymakers in developing comprehensive, adaptable, and nation-specific policies. Governments and agencies must continually update and review their strategies to align with the evolving situation and their capabilities. In conclusion, the study of climate change is a continuous process, requiring sustained efforts and flexibility due to the inherent uncertainties in managing these challenges.

Recommendations for Climate Change Adaptation

Defend Strategy for Water Resources

Adaptation measures for water resources often involve defensive actions, such as constructing walls, using sandbags, and elevating buildings to safeguard water collection areas. This approach is typically viable when protecting land and infrastructure of high economic or strategic value. Locally, beach or mud nourishment and, regionally, sediment management are preferred methods under this strategy, although they come with high implementation and maintenance costs.

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Accommodate Strategy

This approach involves accepting more flooding in coastal or designated areas to maintain water resources. It may require new land use strategies to facilitate development and agricultural activities, adapting to new economic activities focused on area sustainability due to environmental transformations.

Reactive Adaptation for Water Resources

Emphasising the protection of water resources includes improving the management and maintenance of existing water supply systems, often a governmental effort. Protecting water catchment areas through defensive or accommodative strategies enhances water resource capacity, alongside measures to improve water supply by increasing resources to prepare for climate change impacts.

Anticipatory Adaptation for Water Resources

Focusing on recycling and enforcement, this adaptation encourages water recycling to ensure resource availability. Conservation of water catchment areas and improved management systems are crucial. Additionally, it involves developing flood control and drought monitoring systems.

Reactive Adaptation in Agriculture and Food Security

This entails erosion control to prevent wind and water erosion, which is essential for uninterrupted agricultural activities. It involves maintenance and development efforts like changing fertiliser usage and managing soil fertility. Exploring new production technologies and harvesting plans to adapt to climate changes are also integral. This adaptation aims to evolve food security measures, particularly in agriculture.

Anticipatory Adaptation in Food Security

This approach includes developing crops tolerant or resistant to drought and salt and enhancing insect or pest control. Emphasizing research and development, it prepares for future food security challenges. Diversification and intensification of food and plantation crops are part of this strategy, along with policy measures such as tax reductions or subsidies to encourage agricultural activities. This adaptation is focused on ensuring survivability and preparedness to face the impacts of climate change on food security.

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Conclusion

While the Malaysian Government has implemented various policies, actions, and measures to combat climate change, Malaysia's challenges are common. Still, they are shared across the Asia Pacific region due to similar climatic conditions and regional environmental factors. As a result, adaptation and mitigation strategies are often developed within the context of regional capacities, with standard measures and actions tailored to these shared environmental challenges.

Focusing on Malaysia, the disruption of ecosystems has significantly impacted water and food security. Therefore, the measures adopted must align with the country's capability to manage and adapt to climate change effects sustainably. In the broader context, the study of climate change is increasingly becoming a global priority. The interconnected nature of climate change issues means that strategies and policies need to be informed by a wide array of studies and perspectives. Policymakers must integrate insights from various disciplines to formulate effective and context-specific policies. These policies should be comprehensive, providing clear guidelines and specific actions tailored to address the threats and challenges posed by climate change.

The Malaysian National Policy on Climate Change exemplifies a proactive approach, supporting initiatives and raising awareness among Malaysians about the importance of combating climate change. This policy is a testament to Malaysia's commitment to addressing climate change through government-led initiatives and fostering a broader understanding and participation among its citizens. As such, the continued focus on climate change research, policy development, and public engagement remains essential for adapting to and mitigating the impacts of this global issue.

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Colonel Zaabar bin Jaaffar

Colonel Zaabar bin Jaaffar was commissioned on 17th May 1994 into the Royal Malay Regiment (RMR). He served in the 24 Battalion Royal Malay Regiment as his first unit as Platoon Commander. Over the past 9 years in the service, he continued his command as Company Commander at 8 Battalion Royal Malay Regiment in 2003. He was given sustenance to attend the Malaysian Armed Forces Staff College in 2005. After finishing Staff College, he was appointed Staff Officer 2 Admin at 5 Brigade Headquarters. In Jan 2012, Col Zaabar bin Jaaffar was promoted to Lieutenant Colonel and became the Commanding Officer of 25 Battalion Royal Malay Regiment. After finishing his command, he was appointed Staff Officer 1 Personal at the Infantry Directorate, Army Headquarters. To enhance their skill, he was given to attend the Malaysian Armed Forces Defence College in 2018, and right after completing it, he was appointed as Chief of Staff at 8 Brigade Headquarters in Jan 2019. On completing his duty as the Chief of Staff at 8 Brigade Headquarters, he was appointed Colonel Administration at Army Field Command West in 2020. His eminence has been confirmed by being sent to attend the course at National Resilience College in 2023.

The Statesman Journal
2023, Vol 1 125 - 140
ISSN-2811-454x

MALAYSIA'S DEFENCE STRATEGY OF CREDIBLE PARTNERSHIP: BENEFITS AND CHALLENGES OF AN INCREASED PARTICIPATION IN PEACEKEEPING OPERATIONS

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Abstract

Malaysia has actively participated in United Nations Peacekeeping Operations (UNPKO) since gaining independence in 1957, aligning its foreign policy with international cooperation and diplomacy. Despite being a developing nation with limited military and economic resources, Malaysia has significantly contributed to UN peacekeeping missions, deploying troops in various global roles. This paper explores Malaysia's contributions to UNPKO, highlighting the benefits and challenges faced by the Malaysian Armed Forces (MAF) and the nation. The benefits of Malaysia's involvement in UNPKO include enhancing its international reputation, fostering regional cooperation, gaining financial compensation, and strengthening diplomatic ties. Malaysia's participation has also contributed to modernising its armed forces, improved professionalism, and provided valuable experience in conflict resolution and humanitarian assistance. Furthermore, Malaysia's active role in peacekeeping aligns with its foreign policy objectives and demonstrates its commitment to international peace and security. However, increased participation in peacekeeping missions presents several challenges for Malaysia. These challenges include the strain on MAF resources, the need for extensive pre-deployment training, financial commitments, and the delicate balance between domestic and international security priorities. Additionally, meeting UNPKO requirements, including more female troops and specialised equipment, poses logistical and financial challenges for the Malaysian government. Despite these challenges, Malaysia's commitment to UNPKO remains driven by its adherence to international obligations, desire to contribute to global peace, and strategic positioning as a responsible international actor. As Malaysia continues to evaluate its participation in UN peacekeeping missions, it must carefully consider its capacity, readiness, and evolving security landscape to ensure its contributions align with its defence strategy of credible partnerships. This essay analyses Malaysia's participation in UNPKO, evaluates its benefits and challenges, and provides insights into the nation's strategic considerations as it navigates the evolving landscape of international peacekeeping operations.

Keywords: *Defence Strategy, Malaysia, Malaysian Armed Forces (MAF), Peacekeeping, United Nations Peacekeeping Operations (UNPKO)*

Introduction

Malaysia's active engagement in United Nations Peacekeeping Operations (UNPKO) has been a consistent feature of its foreign policy since achieving independence in 1957. *Malaysia's post-independence foreign policy, rooted in principles of international cooperation and diplomacy, has seen the nation actively participating in various United Nations (UN) initiatives and other supranational organisations (Saravanamuttu, 1993).*

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Despite being a developing nation with comparatively limited military and economic resources, Malaysia has proactively addressed global challenges, particularly peace and security. In light of its status as an average developing nation, Malaysia's military and economic capabilities are naturally less robust than those of more developed countries. Furthermore, the nation's political influence on the global stage, particularly in shaping international affairs related to peace and security, remains relatively modest. Nonetheless, Malaysia has consistently demonstrated its commitment to the objectives outlined in the UN Charter by providing valuable assistance and aligning itself with the UN's mission to maintain international peace and security.

One of Malaysia's notable contributions to advancing the UN's objectives is its active involvement in enforcing global stability through participation in peacekeeping operations. These missions are typically based on resolutions, sanctions, and mandates established by the UN Security Council (UNSC). The Malaysian Armed Forces (MAF) plays a pivotal role in these peacekeeping endeavours, fulfilling a range of tasks encompassing military observation, battalion deployments, law enforcement personnel, and technical experts. Malaysia's involvement in peacekeeping operations dates back to the period from 1960 to 1963 when it deployed military troops to the United Nations Operation in Congo (UNOC). Despite its relatively recent independence, this historical deployment profoundly impacted the MAF and showcased Malaysia's unwavering commitment to fostering global peace.

Over the years, Malaysia has actively participated in over thirty peacekeeping military operations and missions spanning various continents. This extensive engagement has involved nearly 25,000 personnel. While contributing significantly to the cause of international peace, Malaysia has not been spared from sacrifices, losing 28 of its personnel during these missions (UNPKO: Fatalities by Nation up to 31 January 2018). Some of the notable UN peacekeeping missions involving Malaysian forces include deployments to the Democratic Republic of Congo (MONUSCO), Lebanon (UNIFIL), Liberia (UNMIL), South Sudan (UNMISS), Darfur (UNAMID), Abyei (UNISFA), and Western Sahara (UNAMID), among others.

Malaysia's commitment to peace and security is further exemplified by its participation in endeavours like the International Monitoring Team (IMT), tasked with overseeing ceasefires in Mindanao, Philippines, as well as its involvement in peace enforcement missions, such as the Stabilization Force under the North Atlantic Treaty Organization (NATO) Command in Bosnia and Herzegovina (Hasanudin, 2004). Malaysia's contributions to UN peacekeeping operations underscore its unwavering dedication to global peace and security. These efforts align with its foreign policy objectives and exemplify the nation's willingness to actively participate internationally despite its status as a developing country.

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As Malaysia continues to evaluate its role in UNPKO missions, it grapples with various benefits and challenges, shaping its approach to maintaining international peace and security in line with its defence strategy of credible partnerships.

The Defence Strategy

The Malaysian Defence Strategy of "Credible Partnership" constitutes the third pillar of the nation's defence strategy, as outlined in the Defence White Paper. This strategic approach emphasises fostering robust and dependable defence collaborations with external partners. Its primary goal is to bolster Malaysia's defence preparedness and effectively address its security requirements. Under this pillar, Malaysia actively engages in defence-related activities globally, aiming to establish its credibility as a reliable and trustworthy partner within the broader international defence community. Malaysia is deeply involved in forging strategic alliances with neighbouring nations through bilateral and multilateral agreements. These agreements are instrumental in establishing a foundation of trust and credible partnerships in defence. This collaborative effort spans various areas, encompassing joint military exercises, intelligence sharing, and capacity-building initiatives.

As delineated in the White Paper, Malaysia is resolutely committed to expanding its posture of "Credible Partnerships" to advance its defence interests. This includes effectively managing security challenges shared with partner nations and championing its interests on the global stage. Malaysia has reaffirmed its enduring dedication to enhancing its worldwide engagement and contributions to international peace and security. To uphold this pillar, Malaysia maintains a steadfast commitment to the principles enshrined in the United Nations Charter and actively participates in UN peacekeeping operations and missions. Furthermore, Malaysia consistently upholds the spirit of bilateral and multilateral cooperation by facilitating regular meetings among Defense Ministers and Chiefs of Defense Forces. These meetings are vital for discussing pertinent issues and reinforcing strategic relationships, particularly security and sovereignty.

Malaysia's contributions to UN peacekeeping operations/missions

United Nations Peacekeeping Operations (UNPKO) stands as one of the United Nations' earliest and most widely employed mechanisms for conflict resolution. This global endeavour is celebrated for its effectiveness in securing, providing assistance, and offering relief to conflict-ridden nations. It operates by orchestrating the initial transition from volatile and complex conflict situations to a state of peace. The overarching objectives of UNPKO include preventing enduring power struggles and ending protracted conflicts involving participating states.

This mechanism symbolises the international community's commitment to upholding global security and peace (R. Thakur, 2006). Malaysia's Armed Forces and other security and technical personnel have significantly contributed to over thirty UN PKO missions. Their involvement has spanned various roles, including military observers, battalion groups, UN staff members, technical experts, and medical professionals (Malaysia UNSC, 2015). Malaysia's commitment to UN peacekeeping extends beyond traditional missions, as exemplified by its participation as a member of the Stabilization Force under NATO Command in Bosnia and Herzegovina. Here, Malaysia's role evolved from peacekeeping to peace enforcement. Moreover, Malaysia has actively engaged in non-military missions, such as dispatching a Military Medical Team to Afghanistan, assisting in election oversight in Cambodia, and contributing to the nation-building efforts in Timor-Leste.

Despite its status as a relatively small state, Malaysia recognises that maintaining its security and ensuring its survival as a sovereign nation are essential imperatives. Malaysia has adopted a strategic posture of adhering to international obligations and norms to effectively achieve these objectives and pursue its national interests. This commitment is prominently exemplified by its unwavering support for the United Nations Charter and its active engagement in advancing the organisation's agenda for global peace.

Remarkably, Malaysia has consistently responded positively to the United Nations' requests for contributions of military, police, and technical personnel across various missions worldwide. This commitment is particularly notable given Malaysia's resource constraints and limited technical capabilities. Malaysia's participation in UN PKO missions has drawn upon the expertise of officers and personnel with specialised skills from all three branches of the Malaysian Armed Forces, the Royal Malaysian Police, and other government agencies. Notably, the United Nations has acknowledged and expressed appreciation for Malaysia's performance and services, even in challenging environments characterised by hazardous conditions and adverse climate and terrain (Malaysia UNSC, 2015).

For Malaysia, the ultimate goal is to attain the highest possible level of self-sufficiency and consistency in various facets. Given the nation's limitations in terms of resources, technology, and raw materials for self-reliant food production, there is an imperative to emphasise overall self-reliance capabilities. This emphasis revolves around addressing concerns related to internal security, safeguarding national interests, and preserving territorial integrity and sovereignty, especially against low and medium-level threats in the immediate vicinity. The Malaysian Armed Forces (MAF) play a pivotal role in upholding Malaysia's comprehensive and multifaceted security policy. The primary mission of the MAF is to defend the nation and its strategic interests, safeguarding its integrity and sovereignty against external threats.

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In addition to this paramount mission, the MAF also shoulders responsibilities such as assisting civil authorities in maintaining public order and addressing internal threats, participating in relief efforts during national calamities and emergencies, and contributing to the nation's development. Therefore, participation in UNPKO missions is considered an additional task that the MAF undertakes in line with Malaysia's broader security and defence objectives.

Obligation to participate

As a nation in the process of development, Malaysia is diligently advancing its economic and financial growth, all while managing its defence capabilities, which are comparatively modest in scale. Safeguarding its national sovereignty and interests is paramount in this context. Malaysia's strategic approach revolves around neutrality and non-alignment with any military power, whether regional or global, a stance that is instrumental in preserving its sovereignty and territorial integrity.

Malaysia's dedication to these principles underscores its sense of responsibility on the international stage. By doing so, Malaysia not only cultivates and maintains cordial and harmonious relationships with all friendly nations but also actively upholds the core values articulated in the UN Charter and its resolutions. This includes contributing to Peacekeeping Operations, where Malaysia plays an active and constructive role in pursuing global peace and stability. This obligation is clearly stated in Article 2 and Article 43 of the UN Charter, respectively:

a. Article 2 - The Organisation and its Members, in pursuit of the purposes stated in Article I, shall act in accordance with the following Principles. All Members shall give the United Nations every assistance in any action it takes in accordance with the present Charter, and shall refrain from giving assistance to any state against which the United Nations is taking preventive or enforcement action.

b. Article 43 - All Members of the United Nations, in order to contribute to the maintenance of international peace and security, undertake to make available to the Security Council, on its call and in accordance with a special agreement or agreements, armed forces, assistance, and facilities, including the right of passage, necessary for the purpose of maintaining international peace and security.

Participating in peacekeeping missions is a pivotal politico-strategic decision for nations across the globe. For Malaysia, this commitment aligns seamlessly with one of its core foreign policy objectives: active and meaningful engagement within the United Nations.

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Malaysia's participation in UN peacekeeping missions underscores its commitment to opposing injustice and persecution and reflects its steadfast dedication to upholding international law. This strategic involvement bolsters the Malaysian Armed Forces (MAF) reputation and aligns with the nation's broader foreign policy goals.

As a developing nation, Malaysia relies on the United Nations system to safeguard its vital interests, particularly territorial integrity and sovereignty. Malaysia remains a staunch advocate of UN membership, recognising it as an essential platform for amplifying the voices and perspectives of smaller nations on the global stage. By actively contributing to UN peacekeeping operations, Malaysia augments its foreign policy initiatives and reinforces its status as a sovereign nation. Furthermore, Malaysia's proactive engagement in UNPKO has facilitated its evolution within the international political arena. This engagement serves as a means for Malaysia to exert influence, particularly concerning security-related conflicts, and navigate diplomatic channels to foster cooperation and garner international support for its defence strategy and national interests.

The transformation of the Malaysian Armed Forces in peacekeeping operations has been instrumental in sustaining Malaysia's continued commitment to these missions. Malaysia's active involvement on the international stage has allowed it to wield influence when seeking international support and cooperation to pursue its defence strategy and broader national interests. Across various peacekeeping operations and missions, Malaysian troops have consistently discharged their duties with the utmost professionalism, impartiality, and dedication. These exceptional performances have earned Malaysia commendation and recognition from the United Nations Secretariat (Agam, 1999).

Benefits gained by the Nation and MAF

Malaysia's continued active participation in United Nations Peacekeeping Operations (UNPKO) remains a charter obligation and a strategic imperative driven by various compelling reasons. This commitment has yielded substantial benefits and contributions to the nation, the Malaysian Armed Forces (MAF), and the international community. Former Malaysian Army Chief Tan Sri Dato' Seri Mohd Zahidi bin Haji Zainuddin articulated that Malaysia's involvement in UN Peacekeeping Operations has yielded no negative impact. On the contrary, it has engendered significant advantages, such as enhancing MAF's interoperability with other military forces and facilitating doctrinal changes. Malaysia's judicious selection of peacekeeping missions, based on the voluntary nature of these operations, allows the nation to maximise the gains from its participation.

This continuous participation has indirectly bolstered the capabilities of the MAF, fostering improvements in its peacekeeping doctrines while advancing the nation's foreign policy objectives. MAF personnel across all echelons benefit immensely from this involvement. They acquire invaluable experience in conflict resolution and humanitarian assistance, which enhances their professionalism and aptitude for operating in diverse domains and environments. The acquired expertise and experience are a source of morale and confidence among MAF personnel, reinforcing their self-perception as proficient professionals capable of fulfilling their duties alongside troops from other nations. Additionally, participation in UNPKO provides monetary compensation through allowances paid by UNPKO, benefiting those involved.

For Malaysia, UNPKO participation yields numerous advantages. It elevates the nation's recognition and prestige on the global stage, fosters regional cooperation, and contributes to financial compensation, as the UN remunerates participating nations for deploying their troops in peacekeeping operations—this indirect source of revenue bolsters Malaysia's economic standing. Furthermore, by projecting a positive image, Malaysia influences other nations to engage more extensively in various areas, including political, social, defence, and economic collaborations. Malaysia's active participation heightens its international visibility and awareness, drawing attention to the safety and security of Malaysia and its regional neighbours in the event of conflicts. Participating in multinational environments exposes the MAF to diverse military practices, fostering knowledge sharing and mutual learning.

This interaction benefits Malaysia by verifying the operational capability of the MAF across various terrains and climates, laying the foundation for tactical and strategic improvements. Malaysia's active engagement underscores its commitment to contributing significantly to global peace, further solidifying diplomatic and military relationships with other participating nations. This posture positions Malaysia as a Participating in multinational environments that expose the MAF to diverse military practices, fostering knowledge sharing and mutual learning. This interaction benefits Malaysia by verifying the operational capability of the MAF across various terrains and climates, laying the foundation for tactical and strategic improvements.

Malaysia's active engagement underscores its commitment to contributing significantly to global peace, further solidifying diplomatic and military relationships with other participating nations. This posture positions Malaysia as a global political player beyond its obligatory responsibilities. Following its non-alignment policy since gaining independence, Malaysia has chosen peacekeeping missions to enhance its combat operation experience without forming direct alliances with superpowers. Participation in UNPKO missions fortifies defence cooperation, particularly with friendly forces participating in the same missions.

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The interaction between Malaysian troops and their counterparts from other nations facilitates knowledge sharing, technology transfer, and mutual relationship building, contributing to future cooperation and understanding. A noteworthy advantage arising from Malaysia's active participation in United Nations Peacekeeping Operations (UNPKO) is the establishment of the Malaysian Peacekeeping Centre, which has received partial funding and support from the United Nations. As the inaugural centre of its kind in Southeast Asia, it is wholly devoted to multifaceted peacekeeping training. This institution is a vital platform through which Malaysia can impart its extensive experiences to Asian and African nations that deploy their armed forces personnel, police, and civilians to international peacekeeping missions. Consequently, Malaysia's commitment to international goodwill and cooperation is solidified, bolstering its reputation as a staunch promoter of these principles. Ultimately, Malaysia's involvement in UNPKO extends beyond conventional national security duties. It provides the MAF with transnational exposure, facilitating military readiness while minimising concerns among neighbouring nations about the country's military modernisation and capabilities.

This participation has led to an enhanced reputation for the MAF. It lays the groundwork for ongoing force development in various operational dimensions, stemming from the valuable experience gained during UN peacekeeping missions: government commitment and deployment policy. Participation in United Nations Peacekeeping Operations (UNPKO) is a complex and multifaceted decision for any nation, driven by a combination of factors that intertwine national interest, international values, strategic considerations, and practical incentives. While these motivations can be subjective and diverse, they provide states with various variables to consider, offering ample room for strategic, political, and tactical manoeuvring. States often begin their deliberations on UNPKO participation by assessing their national interests. These interests may encompass various aspects, including safeguarding domestic stability, promoting international values like human rights and global peace, upholding their reputation as responsible international actors, and respecting principles such as state sovereignty and self-determination. These subjective motivations offer states a spectrum of options, granting them considerable flexibility in their decisions regarding UNPKO involvement.

Malaysia's active role in UNPKO has brought significant benefits, notably modernising its armed forces with advanced equipment and weaponry, thereby boosting military capabilities and readiness. This involvement has also enhanced Malaysia's global standing, establishing it as a soft power player and a respected regional leader. Malaysia's consistent participation in UNPKO missions aligns with its foreign policy objectives and national interests, further reinforcing its international reputation.

MALAYSIA'S DEFENCE STRATEGY OF CREDIBLE PARTNERSHIP: BENEFITS AND CHALLENGES OF AN INCREASED PARTICIPATION IN PEACEKEEPING OPERATIONS

Since gaining independence, Malaysia has progressively increased its involvement in UNPKO missions. This commitment has continued across different administrations, reflecting the nation's evolving foreign policy and national interest considerations. Notably, many of Malaysia's UNPKO deployments have been concentrated in its Strategic Interest Zone (SIZ), underlining the strategic importance of these missions concerning the country's broader foreign policy goals.

However, it is essential to acknowledge the financial commitments and capabilities required to facilitate UNPKO participation. The government's ability to finance pre-deployment training for troops, procure specialised equipment, and fulfil logistical requirements is crucial in determining whether Malaysia participates in offered missions. The readiness and preparedness of deployed troops are pivotal, directly influencing mission outcomes. Thorough peacekeeping training is essential to ensure uniform understanding, maintain good health among troops, cultivate diverse attitudes, foster ethnic tolerance, and uphold the core principles of peacekeeping operations. Over the years, Malaysia's involvement in modern peacekeeping operations has become more intricate and multifaceted.

It has expanded beyond maintaining peace to include humanitarian assistance, support for local law enforcement agencies, facilitation of fair elections, and promoting human rights principles. Consequently, the preparation and training required for troops to undertake these diverse tasks have become more complex, diversified, and challenging. In summary, Malaysia's participation in UNPKO missions is driven by a combination of factors, including national interest, foreign policy objectives, and the pursuit of international values. This engagement has contributed to modernising the Malaysian armed forces and elevated the nation's international profile. However, the decision to participate in UNPKO missions is also influenced by financial commitments, logistical considerations, and the readiness of deployed troops, all of which play a crucial role in mission success.

Issues and Challenges faced by the Malaysian Armed Forces due to Increased Participation in Peacekeeping Missions

One of the most significant challenges the Malaysian Armed Forces (MAF) faces in participating in United Nations Peacekeeping Operations (UNPKO) is the meticulous preparation required for peacekeeping troops before they can be effectively deployed. Rigorous medical examinations characterise this preparation process to ensure the health and fitness of troops, followed by comprehensive training tailored to the specific mission's requirements. Once deemed medically fit for the mission, troops undergo intensive training designed to equip them with the skills and knowledge necessary for the tasks they will perform during the mission.

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A critical consideration in UNPKO deployments is the number of troops the United Nations requires. UNPKO requirements determine these numbers and must be adhered to by contributing nations. For instance, deploying troops for a mission like UNIFIL-MALBATT necessitates a substantial personnel count, which can significantly impact the efficiency of the MAF in fulfilling its primary duty of defending and maintaining national security and sovereignty. Given Malaysia's strategic interest, particularly in areas like the South China Sea and following incidents such as the Lahad Datu standoff, there is a growing need for troops from peninsular Malaysia to support domestic operations in East Malaysia, making the selection of troops for peacekeeping missions a challenging endeavour.

Another substantial challenge is meeting the equipment and vehicle requirements specified by UNPKO for the deployed troops. The contributing nation is responsible for fulfilling these requirements before deployment can proceed. If the necessary equipment and vehicle types are not currently within the MAF's inventory, procurement and acquisition depend on the government's fiscal capacity. The financial constraints faced by the government can pose significant challenges to the MAF's ability to deploy troops for current and future peacekeeping operations. For example, the decision by UNPKO to replace certain vehicle assets used by MALLBAT-850 in UNIFIL with High Mobility Light Tactical Vehicles (HMLTV) necessitates the procurement of new vehicles and the return of surplus (old) assets to Malaysia by 2023.

While the UN compensates for procurement costs, Malaysia's ability to make such investments in advance can be limited by current fiscal commitments. The imperative to increase the representation of female troops in UN-sponsored military peacekeeping missions, as outlined in UN Security Council Resolution 2242, presents another challenge for the MAF and the nation. The resolution calls for including at least 15% female troops in military contingents deployed by 2028. The number of female soldiers deployed in MALLBAT-850 is 87 (MALLBAT 9), whereas at least 128 personnel are required to meet UNPKO requirements. The challenge lies in the fact that female personnel in the MAF are primarily from service support roles rather than combat positions. This increases the workload on male troops, as female counterparts cannot participate in combat duties. Additionally, considerations related to accommodations and facilities for the female forces in missions like UNIFIL require attention, with associated morale and financial implications.

Cultural, religious, ethnic, and traditional differences in conflict zones present psychological challenges for MAF troops during peacekeeping missions. Adapting to these diverse and sometimes hostile environments can be demanding, and failure to do so effectively can have significant consequences.

To address these challenges, rigorous pre-deployment training is essential. This training should be tailored to address specific areas, ensuring that troops are physically and mentally prepared for the mission's demands. In light of the evolving complexities of modern peacekeeping operations, military peacekeepers require systematic and comprehensive training programs that cover various aspects of their roles. This includes knowledge of international law, military tactics, force protection, gender awareness, humanitarian law, and more. Troops must be able to navigate different threat levels, understand their liabilities and accountabilities, coordinate with various agencies, manage civil-military relations, and effectively engage with the media. The MAF faces the challenge of ensuring that its peacekeepers receive training that adequately prepares them for these multifaceted responsibilities, safeguarding the nation's image and reputation as a capable and trusted peacekeeping force.

Another challenge relates to the legitimacy of UN operations in situations where the parties to the conflict have yet to provide express consent. Peacekeepers are increasingly deployed in ongoing armed conflicts, often in hostile environments, with no assurance of being treated respectfully by the involved parties. This poses a considerable safety risk to troops, as their presence needs explicit authorisation, and there is a limited guarantee of international protection against hostilities. Effective communication among nations participating in peacekeeping missions can also be challenging, given differences in doctrine, training, equipment, and capabilities. To address these issues and ensure the safety of deployed troops, the government and the MAF must prioritise force protection and safety considerations before committing to UNPKO missions.

In summary, Malaysia's participation in UNPKO missions is fraught with challenges related to troop preparation, equipment and vehicle requirements, gender representation, cultural differences, and the evolving complexities of peacekeeping operations. To overcome these challenges and make informed decisions about participation, Malaysia must ensure that UNPKO missions are legitimate, receive substantial political support from the international community, and align with the nation's fiscal capabilities and strategic interests.

Conclusion

Malaysia has actively participated in United Nations Peacekeeping Operations (UNPKO) since gaining independence in 1957, aligning its foreign policy with international cooperation and diplomacy. Despite being a developing nation with limited military and economic resources, Malaysia has significantly contributed to UN peacekeeping missions, deploying troops in various global roles.

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The benefits of Malaysia's involvement include enhancing its international reputation, fostering regional cooperation, gaining financial compensation, and strengthening diplomatic ties. Malaysia's participation has also contributed to modernising its armed forces, improved professionalism, and provided valuable experience in conflict resolution and humanitarian assistance.

However, increased participation in peacekeeping missions presents several challenges for Malaysia, including strain on MAF resources, the need for extensive pre-deployment training, financial commitments, and the delicate balance between domestic and international security priorities. Meeting UNPKO requirements, including more female troops and specialised equipment, poses logistical and financial challenges for the Malaysian government. Malaysia's commitment to UNPKO remains driven by its adherence to international obligations, desire to contribute to global peace, and strategic positioning as a responsible international actor. As Malaysia continues to evaluate its participation in UNPKO missions, it must carefully consider its capacity, readiness, and evolving security landscape to ensure its contributions align with its defence strategy of credible partnerships.

The Malaysian Defence Strategy of "Credible Partnership" is the third pillar of the nation's defence strategy, focusing on fostering robust and dependable defence collaborations with external partners. This strategy aims to bolster Malaysia's defence preparedness and address its security requirements. Malaysia actively engages in defence-related activities globally, seeking to establish its credibility as a reliable and trustworthy partner within the broader international defence community. Malaysia is deeply involved in forging strategic alliances with neighbouring nations through bilateral and multilateral agreements, which are instrumental in establishing a foundation of trust and credible partnerships in defence. Malaysia is committed to expanding its "Credible Partnerships" posture to advance its defence interests, including effectively managing security challenges shared with partner nations and championing its interests on the global stage. To uphold this pillar, Malaysia maintains a steadfast commitment to the principles enshrined in the United Nations Charter and actively participates in UN peacekeeping operations and missions.

This essay critically analyses and evaluates Malaysia's contributions to UN peacekeeping missions, considering the nation's defence strategy of "Credible Partnerships." It offers recommendations regarding whether Malaysia, through the Malaysian Armed Forces (MAF), should continue its active and cumulative involvement in PKOs within the framework of the third defence pillar. Malaysia, a developing nation, is committed to maintaining its sovereignty and territorial integrity through its strategic approach of neutrality and non-alignment with any military power.

This commitment is exemplified by its unwavering support for the United Nations Charter and its active engagement in advancing the organisation's agenda for global peace. Malaysia's commitment to peacekeeping operations aligns with its core foreign policy objectives, such as active and meaningful engagement within the United Nations. Malaysia relies on the United Nations system to safeguard its vital interests, particularly territorial integrity and sovereignty. By actively contributing to UN peacekeeping operations, Malaysia augments its foreign policy initiatives and reinforces its status as a sovereign nation. This engagement serves as a means for Malaysia to exert influence, particularly concerning security-related conflicts, and navigate diplomatic channels to foster cooperation and garner international support for its defence strategy and national interests.

The transformation of the Malaysian Armed Forces in peacekeeping operations has been instrumental in sustaining Malaysia's continued commitment to these missions. The transformation of the Malaysian Armed Forces in peacekeeping operations has allowed it to wield influence when seeking international support and cooperation to pursue its defence strategy and broader national interests. Malaysia's continued active participation in United Nations Peacekeeping Operations (UNPKO) has yielded substantial benefits and contributions to the nation, the Malaysian Armed Forces (MAF), and the international community. This commitment has engendered significant advantages, such as enhancing MAF's interoperability with other military forces and facilitating doctrinal changes. Additionally, participation in UNPKO provides monetary compensation through allowances paid by UNPKO, benefiting those involved. Malaysia's involvement in the United Nations Peacekeeping Operations (UNPKO) offers numerous benefits, including global recognition, regional cooperation, financial compensation, and increased international visibility. It exposes the Malaysian Armed Forces (MAF) to diverse military practices, fostering knowledge sharing and mutual learning. This interaction helps Malaysia verify its operational capability across different terrains and climates, laying the foundation for tactical and strategic improvements.

Malaysia's active engagement underscores its commitment to contributing significantly to global peace, further solidifying diplomatic and military relationships with other participating nations. Establishing the Malaysian Peacekeeping Centre, which received partial funding and support from the United Nations, is a significant advantage. This institution is devoted to multifaceted peacekeeping training, imparting Malaysia's extensive experiences to Asian and African nations. Malaysia's involvement in UNPKO extends beyond conventional national security duties, providing transnational exposure, facilitating military readiness, and laying the groundwork for ongoing force development in various operational dimensions.

MALAYSIA'S DEFENCE STRATEGY OF CREDIBLE PARTNERSHIP: BENEFITS AND CHALLENGES OF AN INCREASED PARTICIPATION IN PEACEKEEPING OPERATIONS

National interest, international values, strategic considerations, and practical incentives drive the decision to participate in UNPKO missions. Malaysia's involvement in UNPKO missions has modernised its armed forces, enhanced international standing, and elevated its international profile. However, the decision to participate in UNPKO missions is also influenced by financial commitments, logistical considerations, and the readiness of deployed troops. The Malaysian Armed Forces (MAF) faces numerous challenges in participating in the United Nations Peacekeeping Operations (UNPKO). These include meticulous preparation for peacekeeping troops, meeting equipment and vehicle requirements, increasing female representation in UN-sponsored military peacekeeping missions, and addressing cultural, religious, ethnic, and traditional differences in conflict zones. Malaysia's strategic interest in areas like the South China Sea and the Lahad Datu standoff make the selection of troops for peacekeeping missions challenging. Meeting UNPKO requirements also poses financial constraints, as the government's fiscal capacity may limit the MAF's ability to invest in advance.

Additionally, the increasing representation of female troops in UN-sponsored military peacekeeping missions presents psychological challenges for MAF troops. To address these challenges, rigorous pre-deployment training is essential. Malaysia also faces challenges in the legitimacy of UN operations when parties to the conflict have yet to provide express consent. Peacekeepers are increasingly deployed in ongoing armed conflicts, often in hostile environments, with no assurance of respectful treatment by involved parties. Effective communication among nations participating in peacekeeping missions can also be challenging due to differences in doctrine, training, equipment, and capabilities. In conclusion, Malaysia must ensure that UNPKO missions are legitimate, receive substantial political support from the international community, and align with the nation's fiscal capabilities and strategic interests to make informed decisions about participation.

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Brigadier General Suhaimi Shamsuddin

Brigadier General Suhaimi Shamsuddin joined the service in 1989 after completing his A-Level at KPP/UiTM in 1988. Upon completing his cadet training in Bangladesh Military Academy (BMA) with a degree in Political Science, he was later commissioned into 21 Royal Malay Regiment (RMR) in Sandakan Sabah. Later he was posted to 1 RMR as Adjutant before pursuing his Law Degree in UiTM for 4 years. After obtaining his LLB (Hons), he was later posted to 10 Bde Para as Legal Officer. He then served in various Army Formations as Legal Officer before embark to pursue his Staff College in 2005 and later his first Master Program in Law (LLM) from UM. He had also served in various RMR Inf Regiment then, such as Officer-Commanding in 17 RMR Para, Second-in-Command in 25 RMR and later as Commanding Officer back to his 'mother-unit' 21 RMR in Kelantan. He then attended Defence College in 2016 and later was promoted to the rank of Colonel as Director of Law in Army HQ and Head Directing Staff at INSPEKA before being promoted again to Brig Jeneral as a Bde Commander in 13 Bde Inf in Sabah.

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ISSN 2811-454X