The National Planetary Health Action Plan

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Healthy Planet, Healthy Me, Prosperous Nation.

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

AKADEMI SAINS MALAYSIA

NATIONAL PLANETARY HEALTH ACTION PLAN

2025

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Malaysia's National Planetary Health Action Plan (NPHAP) is a national blueprint to secure human and ecological wellbeing by embedding planetary health into governance, development, and daily life.

Academy of Sciences Malaysia
Level 20, West Wing, MATRADE Tower
Jalan Sultan Haji Ahmad Shah off Jalan Tuanku Abdul Halim
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Perpustakaan Negara Malaysia

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List of Abbreviations

AMR	Antimicrobial Resistance
APEL	Accreditation of Prior Experiential Learning
CAT Bonds	Catastrophe Bonds
CBDR	Common but Differentiated Responsibilities
CEPAA	Communication, Education, Public Awareness and Action
CSR	Corporate Social Responsibility
DAN 2.0	National Agrofood Policy 2.0
EPF	Employees Provident Fund
EPPS	Environmental Principles Policy Statement
EPSA	E-Pembelajaran Sektor Awam (Public Service E-Learning)
EQA	Environmental Quality Act
ESG	Environmental, Social and Governance
ETI	Energy Transition Index
FiTs	Feed-in Tariffs
GERD	Gross Expenditure on Research and Development
GHG	Greenhouse Gas
GII	Global Innovation Index
GLCs	Government-Linked Companies
HRDCorp	Human Resources Development Corporation
ICT	Information and Communication Technology
INTAN	Institut Tadbiran Awam Negara
JAKIM	Department of Islamic Development Malaysia
JPNIN	Jabatan Perpaduan Negara dan Integrasi Nasional
KEMAS	Jabatan Kemajuan Masyarakat
KESUMA	Kementerian Sumber Manusia
KKM	Kementerian Kesihatan Malaysia
KPT	Ministry of Higher Education
KRA	Key Result Area
LSS	Large-Scale Solar
MAFS	Ministry of Agriculture and Food Security
MARDI	Malaysian Agricultural Research and Development Institute
MDG	Millennium Development Goals
MIDA	Malaysian Investment Development Authority
MITI	Ministry of International Trade and Industry

MNCs	Multinational Corporations
MOE	Ministry of Education
MOH	Ministry of Health
MOHE	Ministry of Higher Education
MOSTI	Ministry of Science, Technology and Innovation
MQF	Malaysian Qualifications Framework
MRSM	Maktab Rendah Sains MARA (MARA Junior Science College)
MSMEs	Micro, Small and Medium Enterprises
MSPH	Malaysian Standard for Planetary Health
MyAP-AMR	Malaysian Action Plan on Antimicrobial Resistance
NEHAP	National Environmental Health Action Plan
NEM	Net Energy Metering
NETR	National Energy Transition Roadmap
NGOs	Non-Governmental Organizations
NIOSH	National Institute of Occupational Safety and Health
NPHAP	National Planetary Health Action Plan
NTW	National Training Week
OTEC	Ocean Thermal Energy Conversion
PERKESO	Pertubuhan Keselamatan Sosial (Social Security Organisation)
PH	Planetary Health
PPP	Polluter Pays Principle
PTPK	Perbadanan Tabung Pembangunan Kemahiran
R&D	Research and Development
RDCIE	Research, Development, Commercialisation, Innovation and Economy
RE	Renewable Energy
ROI	Return on Investment
ROV	Return on Values
SDGs	Sustainable Development Goals
SMEs	Small and Medium Enterprises
SSM	Suruhanjaya Sekuriti Malaysia
STI	Science, Technology and Innovation
STIE	Science, Technology, Innovation and Economy
TalentCorp	Talent Corporation Malaysia Berhad
TNB	Tenaga Nasional Berhad
TPES	Total Primary Energy Supply
TSLM	Transformational Sustainability Leadership Module
TVET	Technical and Vocational Education and Training
ZEB	Zone of Ecosystem Balance

Foreword

YAB Dato Sri Anwar Ibrahim
Prime Minister of Malaysia

The development of the National Planetary Health Action Plan (NPHAP) marks a defining moment in Malaysia's journey toward a sustainable future. At a time when global challenges like climate change, biodiversity loss, environmental pollution and health threats transcend borders, we must reaffirm our commitment to ensuring planetary health. The wellbeing of our nation is dependent on the health of the planet that sustains us.

Guided by our shared values of sustainability, innovation, trust and compassion, the NPHAP complements existing national policies such as the 13th Malaysia Plan, the National Policy on Climate Change and the National Energy Transition Roadmap. It acts as a catalyst, blending relevant strategies within a coherent, science- based framework that advances planetary and human health.

By pursuing a whole-of-government and whole-of-society approach, the NPHAP invites the public and private sectors, civil society, academia and local communities to unite in the service of a common purpose. It sends out the message that no one is left behind and that progress must be both ambitious and inclusive.

At the heart of this action plan lies our commitment to science, technology and innovation (STI). NPHAP is integral in driving Malaysia toward a low-carbon and knowledge-based economy, and STI is the key enabler in accelerating the transition to renewable energy and green infrastructure as well as harnessing data analytics for health monitoring and climate resilience. This action plan powers the development of technologies, products and services to generate prosperity while safeguarding our planet.

Let the NPHAP stand as a bold testament to Malaysia's leadership in championing planetary health. The decisions we make today will shape the world our children inherit. So let us proceed with courage, collaboration and our collective values.

Congratulations to the Ministry of Science, Technology and Innovation, the Academy of Sciences Malaysia and all other collaborators for their success in crafting this plan. Together, let us ensure that a healthy planet become the foundation for a thriving and just Malaysia for all.

Foreword

YB Tuan Chang Lih Kang
Minister of Science, Technology and Innovation
Malaysia

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

The National Planetary Health Action Plan (NPHAP) marks an important milestone in Malaysia's commitment to safeguarding both human well-being and the health of our planet. As world faces grand challenges due to climate change and rising health threats, the call for integrated, science-based solutions has never been greater.

Malaysia's journey toward a sustainable future is anchored in the principles of Malaysia MADANI, the Sustainable Development Goals (SDGs) and the aspirations of the 13th Malaysia Plan (13th MP). The NPHAP builds on these foundations, providing a comprehensive framework that aligns planetary health with national development priorities. It calls for a whole-of-nation approach, recognising that progress demands collaboration across government, industry, academia, and communities.

Science, technology and innovation (STI) will be the driving force behind this transformation. From climate-resilient infrastructure and clean energy technologies to data-driven decision-making and scientific solutions, STI offers the tools to address complex, interconnected planetary health challenges. The NPHAP reflects Malaysia's vision to leverage STI not only as an enabler of economic growth but as a catalyst for resilience, equity and environmental stewardship.

As we move toward 2030, the global race for green and digital transformation intensifies. Malaysia is proactively fostering a robust research and innovation ecosystem, nurturing talent for the future and mainstreaming planetary health interventions across all sectors. This Action Plan underscores the importance of future-proofing our economy while ensuring that no one is left behind.

I commend the Academy of Sciences Malaysia and all stakeholders who contributed their expertise and passionately developed the NPHAP. The NPHAP is more than an action plan - it is a call to action for every Malaysian to play their part in creating a healthier, safer and more sustainable future. Together, let us seize this opportunity to lead by example, harnessing science and innovation for the well-being of people and planet.

Foreword

Academician Datuk Dr Tengku Mohd Azzman Sharifadeen FASc
President, Academy of Sciences Malaysia & STI Advisor to the Prime Minister and the Nation

The Academy of Sciences Malaysia (ASM) is honoured to present the National Planetary Health Action Plan (NPHAP). This is a bold and timely framework to guide Malaysia's whole-of-nation response to the converging challenges of the Anthropocene era, where human activity is reshaping the future of both people and planet.

We are living in a defining moment. Climate disruption, biodiversity loss, and pollution of air, water and soil are destabilising ecosystems. At the same time, societies face widening inequality, rapid urbanisation, ageing populations and recurring public health crises. Too often, we have normalised profit over purpose, the over-exploitation of resources, and short-term gains over long-term resilience. These patterns of behaviour must be denormalised and replaced with legitimate norms that promote balanced stewardship, fairness and shared responsibility for the sake of future generations.

Addressing these challenges requires collaboration. No single discipline, sector or institution can act alone. The NPHAP was therefore co-created through partnerships across government, academia, business and civil society. It is anchored to four guiding principles: humanity-centric approaches that place people at the heart of development; science, technology and innovation-enabled solutions that guide true transformation; nature-based approaches that work with rather than against ecosystems; and values-internalised change that embeds responsibility, fairness and sustainability into everyday decisions.

Based on these principles, the Action Plan sets out practical pathways for change. It aims to transform governance, align development with sustainability, reimagine how we produce and consume, and reshape behaviours and mindsets. By linking environment and health, strengthening accountability, and ensuring that well-being and resilience are central to progress, the plan turns vision into measurable action. This is where the NPHAP will make a difference: by moving Malaysia beyond incremental improvements towards systemic transformation that safeguards people, protects the planet, and secures long-term prosperity.

Malaysia is well positioned to lead. Our rich biodiversity, cultural heritage, scientific expertise and commitment to inclusive development provide a strong foundation to demonstrate how growth can support both people and planet. Yet we must also confront the trilemma of balancing economic growth, social equity and environmental protection. The NPHAP offers a pathway to resolve this challenge, proving that prosperity, fairness and sustainability can advance together.

NPHAP is more than a guide. It is a national mission and a global statement of intent, an invitation to act together with foresight, integrity and compassion to protect the future of humanity and the planet we call home.

Foreword

Academician Professor Emerita Datuk Dr Asma Ismail FASc
National Planetary Health Action Plan (NPHAP)
Chairperson

The National Planetary Health Action Plan (NPHAP) has been a collective journey—driven by urgency, shaped through collaboration, and grounded in shared responsibility. As Chairperson of this effort, I am grateful to the many individuals and organisations across Malaysia who contributed their knowledge, experience and hopes to build a vision of planetary health that reflects our national identity and priorities. This Whole-of-Nation framework carries the voices of more than 3,500 scientists, policymakers, civil society representatives, youth and business leaders, united by a shared vision and hope. I wish to especially acknowledge the dedication and support of the Pillar leads together with the research team and analysts whose expertise shaped this Plan, particularly Prof Dr Mahendhiran Sanggaran Nair FASc, Prof Dato' Ir Dr A. Bakar Jaafar FASc, Academician Distinguished Prof Datuk Dr Looi Lai Meng FASc, Prof Dr Noorsaadah Abd Rahman FASc, Prof Dato' Ts Dr Kamaruzzaman Sopian FASc, Prof Dato' Dr Zulkifli Idrus FASc, and Prof Tan Sri Dr Jemilah Mahmood; whose leadership provided the intellectual foundation that made this Plan possible.

Malaysia stands at a decisive turning point. Environmental pressures and health risks are converging to strain our food, water, energy and social systems, showing clearly that our current development model can no longer deliver a secure or sustainable future. Planetary health provides a powerful lens to connect human well-being with environmental integrity. It is not a new science, but a new way of linking human health, animal health and environmental health. We cannot afford to sacrifice any one for the other. With every year of delay, the risks deepen—economic losses grow, health costs rise, and our children's futures become more insecure. If we act now, we can restore ecosystems, transition to clean energy, reduce emissions, enhance food security and build greater resilience. If we wait, the damage may become irreversible.

What sets this Plan apart is that it does not replace past policies; it connects and amplifies them. Where past strategies often implemented in silos, the NPHAP aligns actions across government, business, academia and society, embedding science, technology and innovation at its core. It is guided by the 8i Enabling Framework, infrastructure, infostructure, intellectual capital, integrity, incentives, institutions, interaction and internationalisation anchored in the 8R planet-friendly values of respect, rethink, reduce, reuse, recycle, replant, repurpose and revitalise. From this, five systemic shifts emerged: stronger governance of our natural Khazanah, nurturing people and leadership, advancing planet-friendly businesses, fostering values and behaviour change, and mobilising sustainable financing.

The hardest challenge is changing mindsets and behavioural habits. Planetary health may seem abstract, but if every Malaysian takes one proactive action like wasting less food, reducing energy use, supporting planet-friendly businesses; the collective impact across 32 million Malaysians can shape markets, cut pollution and lower costs. This Plan makes such choices easier, more affordable and doable, while investing in leadership and national campaigns to turn sustainability from a duty into a source of pride. As we step into this historic moment, let us be guided by the wisdom often attributed to Native American wisdom: "We do not inherit the Earth from our ancestors; we borrow it from our children."

Let us carry that wisdom forward—towards a Healthy Planet, Healthy Me, Prosperous Malaysia.

EXECUTIVE SUMMARY

Malaysia's *National Planetary Health Action Plan (NPHAP)* is a bold and timely strategy to realign national development with the realities of a planet under pressure. It offers a comprehensive, systems-based framework to protect human and ecological health while securing long-term national resilience, prosperity and fairness. Grounded in science, co-created through broad stakeholder engagement and guided by shared values, the NPHAP represents a Whole-of-Nation response to one of the most urgent challenges of our time.

At its core, the Plan reframes national progress around Return on Values (ROV), a concept that integrates environmental stewardship, social justice and economic well-being into a single, coherent vision. It calls for Malaysia to move beyond outdated, extractive models of growth, replacing short-term profit maximisation (ROI) with long-term, inclusive and nature-aligned development.

Malaysia is particularly well-positioned to lead on planetary health. Its rich biodiversity, cultural diversity and growing innovation ecosystem provide a strong foundation for transformative change. But the stakes are high: six of nine planetary boundaries have already been breached and Malaysia's current trajectory continues to put ecological, economic and public health systems at risk. The NPHAP is Malaysia's answer—a national commitment to change course before these risks become irreversible.

Why Planetary Health? Why Now? This chapter sets the context, arguing that humanity has entered a new era—the Anthropocene—where human activity is the dominant force shaping Earth's future. It presents compelling evidence of environmental degradation, rising disaster costs and public health risks in Malaysia. It critiques the prevailing "zero-sum" development model and calls for a shift from ROI to ROV: a new logic of understanding progress that integrates economic, social and environmental values. The chapter also documents Malaysia's performance against planetary boundaries, warning of long-term consequences if systemic reform is not undertaken.

How the Plan Was Built: This chapter explains the guiding principles, conceptual foundation and methodological process behind the Plan. The NPHAP was developed through a 10-step process combining national consultations, focus groups, surveys, systems analysis and global horizon scanning. It is guided by four core principles: humanity-centric design, science and innovation, nature-based development and universal values. The Plan introduces:

- Six Key Result Areas (KRAs): Governance; Environment and Health; Sustainable Food; Research and Education; Energy Transition; and Values, Culture and Communication.
- Five Systemic Shifts: Transformative changes needed across governance, leadership, finance, behaviour and industry.
- Three Strategic Mechanisms: A Transformational Leadership Module, a Genomic Database for environmental intelligence and an Impact Tracking Framework.
- Analytical tools such as the 8R Values, 8I Enablers and Planetary Health Dynamic Capabilities (adaptive, innovative and absorptive) were used to design interventions that are coherent, measurable and adaptable across sectors and regions. The Plan is built not to replace existing policies, but to align, strengthen and coordinate them around a shared planetary health vision.

Malaysia's Game-Changing Bets: The Six KRAs: This chapter details the strategic priorities and action plans for each Key Result Area:

Governance

Proposes structural reforms to strengthen institutions, empower local governments and embed planetary health into national policy. Three governance models are presented, all leveraging science, technology and innovation (STI) to improve coordination, enforcement and accountability.

Environment and Health

Calls for integrated policies that protect ecosystems while preventing disease and safeguarding public health. Emphasising pollution reduction, ecosystem restoration and resilience against climate-related health risks.

Sustainable Food

Aims to shift Malaysia's food systems towards sustainability and nutrition security. Proposes regenerative agriculture, reduced food waste and equitable value chains that benefit both people and the planet.

Research and Education

Prioritises embedding planetary health across all education levels, reform of curricula to include systems thinking and investment in transdisciplinary research aligned with national goals.

Energy Transition

Advocates for a rapid, just transition from fossil fuels to affordable, reliable renewable energy. Recognises Malaysia's heavy reliance on fossil subsidies and proposes policy and fiscal reforms to catalyse green industries.

Values, Cultural Shift of Society, Behaviour Changes and Communication

Emphasises the social and cultural transformation needed to sustain behavioural change. Calls for values-based campaigns, cross-sector communication strategies and community mobilisation.

Each KRA includes detailed action plans, identifies lead agencies and defines outcome indicators to support performance tracking and adaptive management.

From Plans to Action: This chapter addresses implementation. It identifies critical enabling conditions—such as institutional leadership, financing mechanisms, data systems and behavioural science—and translates them into actionable strategies. Key highlights:

- Institutional Delivery: Proposes a strengthened mandate for the National SDG Council, including planetary health, STI and ESG integration.
- Financing Innovations: Introduces tools such as Catastrophe Bonds, Polluter Pays instruments and Environmental Dividends to incentivise sustainability and share the benefits of ecological restoration.
- Monitoring and Accountability: Outlines an Impact Tracking Framework to assess Return on Values (ROV) across environmental, economic, social and political domains.

The chapter also defines the "end game": a transformed Malaysia that thrives within planetary boundaries, builds inclusive prosperity and contributes actively to global sustainability.

The NPHAP is not just a plan—it is a national shift in mindset, values and governance. It recognises that the health of Malaysians cannot be separated from the health of Malaysia's rivers, forests, air and climate. It seeks to embed sustainability into every level of decision-making, policy and daily life.

By investing in nature-based solutions, green jobs, inclusive governance and systems thinking, Malaysia can lead the region in building a resilient, future-ready society. The NPHAP is a living document, a platform for collective leadership, shared responsibility and enduring impact.

Malaysia's message to the world is clear: a healthy planet is not a constraint on prosperity—it is the foundation of it.

MALAYSIA'S CALL TO ACTION ON PLANETARY HEALTH

In 2015, when world leaders came together in New York to adopt the Sustainable Development Goals (SDGs), scientists introduced the concept of "planetary health." This concept, first outlined in a report by the Lancet-Rockefeller Foundation Commission "Safeguarding Human Health in the Anthropocene Epoch" (Lancet, 2015), defines planetary health as "the health of human civilisation and the state of the natural systems on which it depends."

The report highlighted a troubling reality that in today's Anthropocene era, the planet's natural systems such as clean air, water and fertile soil, are being degraded at an alarming rate. The concept of "health", therefore, requires us to think beyond human well-being. The health of the environment is just as important because human life depends on it.

Planetary health embraces a systems approach, looking at the big picture. It recognises the deep interdependence between human and ecological systems. The way we develop and grow as a society affects nature and in turn, changes in nature, like pollution, extreme weather or biodiversity loss, affect our health and wellbeing.

By adopting this more integrated approach, planetary health can help us understand and respond more effectively to the complex connections between human health and the planet's health and address the systemic challenges that arise from them. This approach is powerfully aligned with the Sustainable Development Goals (SDGs), which are inherently interconnected. Addressing climate change is not just Goal 13 in isolation—it is a catalyst for progress across the entire agenda. For example, reducing emissions and building climate resilience directly improve public health (SDG 3), protect water resources and sanitation systems (SDG 6) and make urban environments more liveable and sustainable (SDG 11). Climate action is not a trade-off. It is a multiplier. Ignoring it undermines the entire development agenda; embracing it accelerates the whole.

Figure 0-1 illustrates the nested structure of the SDGs, in which the biosphere forms the foundation that supports society, which in turn sustains the economy. This hierarchy reflects the core principle of planetary health; that human and economic well-being fundamentally depend on the health of Earth's natural systems. The figure highlights the need for integrated global governance that places environmental sustainability at the heart of decision-making. As the world prepares for the post-2030 development agenda, this model reinforces the urgency for both Malaysia and the global community to align development policies with ecological boundaries to ensure a resilient and equitable future.

For Malaysia, embracing the principles of planetary health can help accelerate progress on the SDGs, strengthen Malaysia's commitments to the Environmental, Social and Governance (ESG) agenda and provide new opportunities to enhance planet friendly economic development. But this requires a Whole-of-Nation approach, bringing together government, industry, academia, civil society, citizens and all of us, to work towards a healthier future for people and the planet.

Malaysia's vision is simple and powerful: **Healthy Planet, Healthy Me, Prosperous Malaysia.**

Building our future on the principles of planetary health is essential if we want a country that is fair, strong and successful, not just for today but for generations to come.

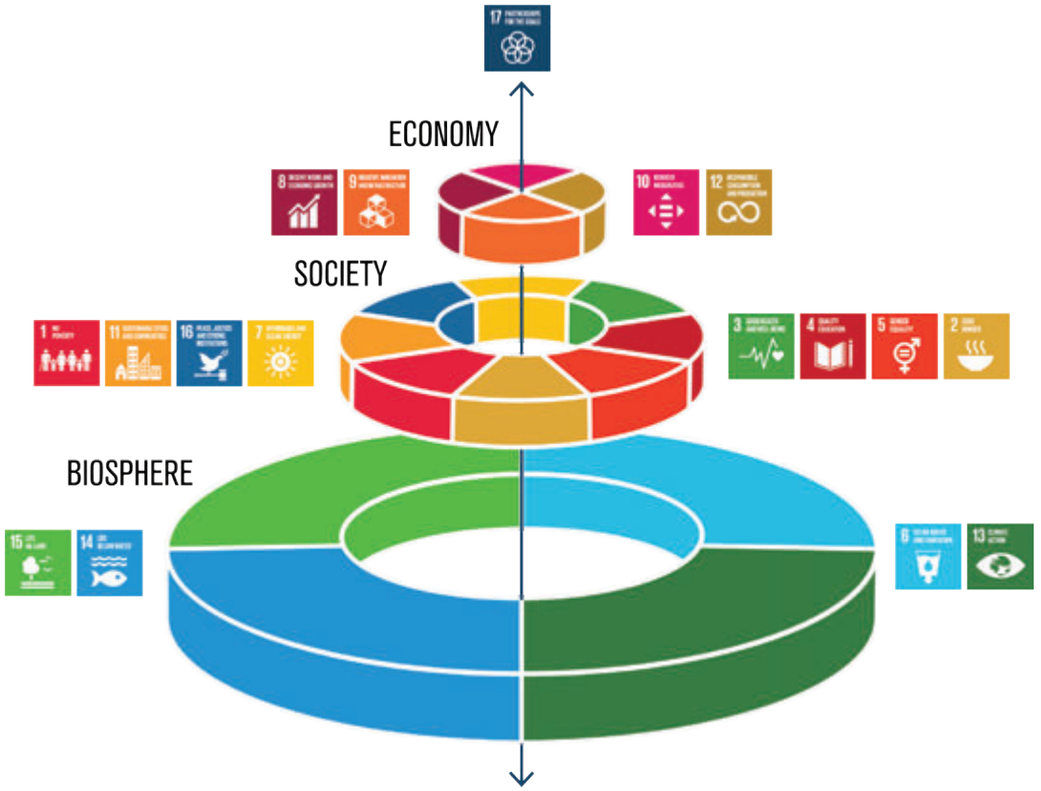


Figure 0-1: The SDGs Wedding Cake, Interconnected Nature of the SDGS

Case Study: Safeguarding Planetary Health in the 13th Malaysia Plan

The 13th Malaysia Plan (RMK-13), published in July 2025, and covering Malaysia's development planning for the next five years, positions planetary health as central to Malaysia's long-term socio-economic resilience. Three integrated strategies underpin this commitment:

- Climate Change and Environmental Management, which includes implementation of a National Adaptation Plan, climate legislation, carbon market mechanisms, blue carbon initiatives, and strengthened environmental governance to enhance resilience and reduce emissions.
- Biodiversity Conservation, where expansion of nature-based solutions including mangrove restoration and coral reef rehabilitation, gazettement of biodiversity-rich areas, and stronger enforcement against wildlife crime and habitat encroachment are all provided with priority status.
- Circular Economy (D6.3) which highlights ambitions regarding new legislation to regulate production and disposal, sustainable waste management, expanded recycling and waste-to-energy facilities, landfill rehabilitation, and promotion of Zero Waste Communities.

Together, these measures embed ecological stewardship within Malaysia's broader development agenda, ensuring that value creation advances together with climate resilience and environmental sustainability.

The many stakeholders involved in the elaboration of this plan should be proud that they have placed planetary health at the heart of our nation's development pathway; the challenge now is to sustain this momentum, raise ambitions further, ensure full alignment with regional and international commitments and, most importantly, secure the health of the country in order to secure the health of its people.

INTRODUCTION: WHY PLANETARY HEALTH? WHY NOW?

1.1 From Anthropocene Crisis to Post-Normal Times

To build a prosperous, resilient and fair future, we must understand our current position—and the path that brought us here. The following chapter introduces the planetary health lens as a response to the crises of our time. It lays the groundwork for Malaysia's transformation by examining the consequences of our current development trajectory, the science behind planetary boundaries and the urgent need to reframe what progress means in the 21st century.

The world is undergoing an unprecedented transformation. As the global population keeps growing, meeting everyone's basic needs and wants, such as food, housing, jobs, access to technology and modern services, is becoming harder, especially as we rely on limited and dwindling natural resources. While the world has experienced substantial economic growth since the Industrial Revolution in the 18th century, much of this progress has come at a serious cost to the planet's health.

Numerous studies show that our current way of developing, a "zero-sum" socioeconomic development model, where gains in one area often come at the cost of others, has badly damaged biodiversity and disrupted Earth's natural systems (Rockstrom et al., 2009; Dasgupta, 2021; Fanning et al., 2022). We now live in what scientists call the Anthropocene, a new era where human activities have become the dominant force shaping the planet's future. These changes have major consequences for the health of the Earth, the only known "blue planet" in our solar system capable of supporting life.

We are also living in what many call post-normal times, a period marked by complexity, chaos and contradiction. Economic growth, social change, politics, culture, technology and environment are all deeply intertwined and at times, in conflict with each other. This tangled web of connections makes it even more difficult to plan for a safe and fair future. Compounding this difficulty is the wide range of ideas, values and beliefs that shape how countries respond to the major threats we all face. The United Nations Development Programme (UNDP, 2022), in its 2022 Human Development Report, calls this the 'uncertainty complex'; a mix of overlapping crises including climate change, conflict, pandemics and economic instability. Together these crises fuel global insecurity and make it harder for leaders to make long-term decisions.

Scientists have issued a 'red alert' to the world. They warn us that we are in the middle of a planetary crisis, largely caused by human-driven climate change. Before the Industrial Revolution, Earth's nine "planetary boundaries", limits that keep the planet safe and stable, were all within safe limits. By 1950, two had already been breached. As of 2025, six of the nine boundaries have been crossed (Figure 1-1). While some countries and communities are acting, the urgency and seriousness of the response still varies widely around the world.

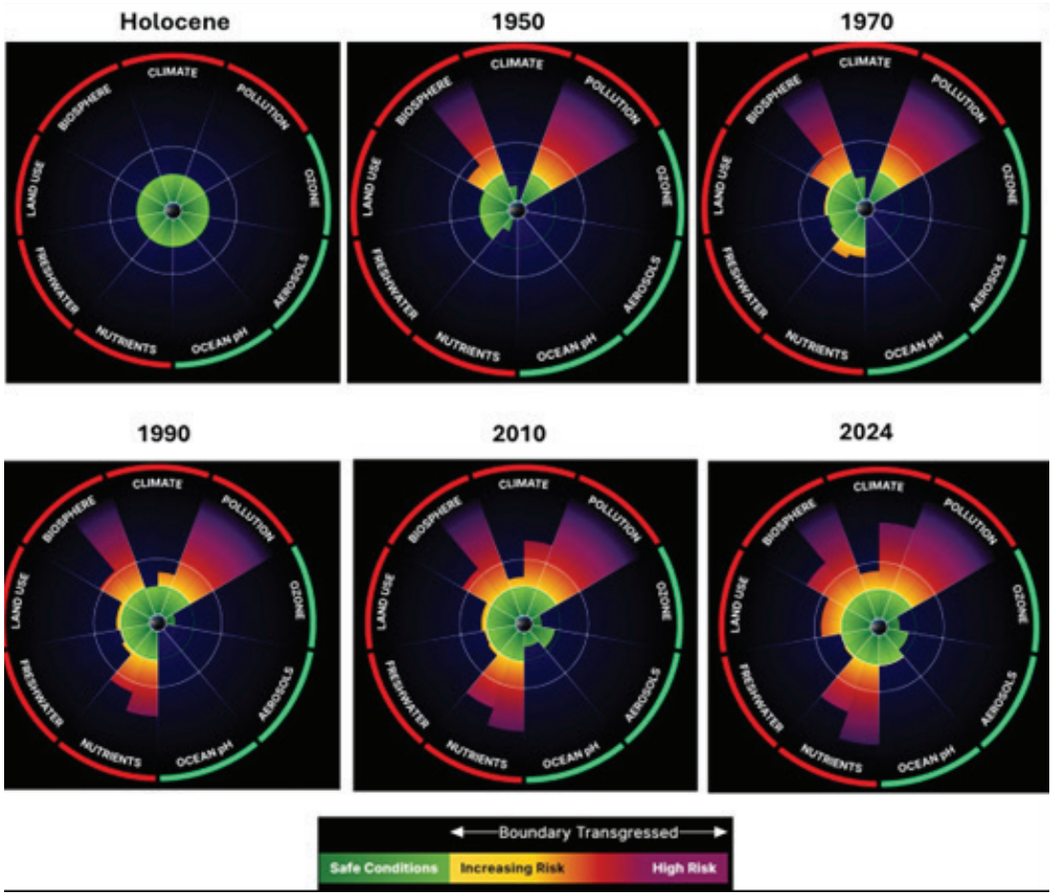


Figure 1-1: State of Planetary Boundaries from Holocene Period - Pre-Industrialisation to 2024

Notes: The Planetary Boundary framework identified nine Earth's systems, which are important for stability in the systems to support life. Each boundary represents a safe operating space; crossing these thresholds risks triggering irreversible changes in the Earth's natural systems. The latter can pose major threat to biological life. The key challenge is to ensure that human activities remain within the so that life on Earth — including human civilisation — can thrive sustainably.

Source: L. Caesar* et al, 2024, Planetary Health Check Report 2024

1.2 From Return on Investment to Return on Values: Rethinking Success

Over the past three centuries, human progress has been powered by technology and an economic model focused on maximising profits, measured by returns on investment (ROI) for corporate shareholders. While this approach has driven innovation and entrepreneurship, significantly increasing global wealth, the benefits have not been shared evenly across countries and communities. More critically, this profit maximisation model has come at a significant cost to the health of the planet.

This traditional "zero-sum" mindset—where short-term financial gain often outweighs long-term environmental concerns—has contributed to climate change, biodiversity loss, damaged ecosystems and species extinction (as shown in Figure 1-2). It has led to breaching the planetary boundaries described in the previous section. These environmental changes directly affect human health and well-being.

Take disasters as one example. Between 2000 and 2019 the world saw 7,348 major climate-related disasters. These events claimed 1.23 million lives, affected 4.2 billion people and caused almost USD 3 trillion in economic losses (UNDRR, 2020). Even more worrying is the pace of change: the number of disasters rose from 3,656 between 1980 and 1999 to 6,681 between 2000 and 2019—an 83 percent increase (UNDRR, 2020).

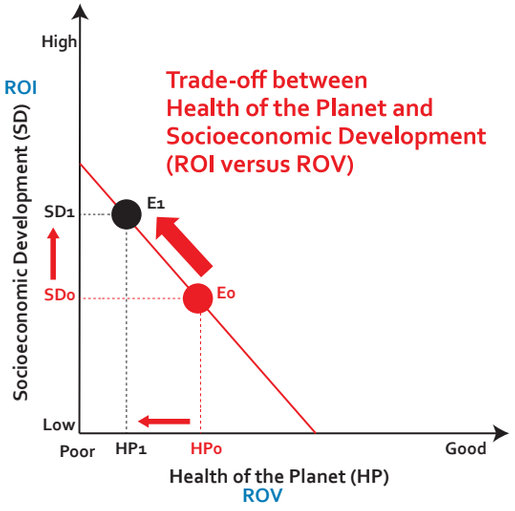


Figure 1-2: Moving Up the Wrong Curve - Zero-Sum Socioeconomic Development Model

Source: Nair, Ahmed and Vaithilingam (2022)

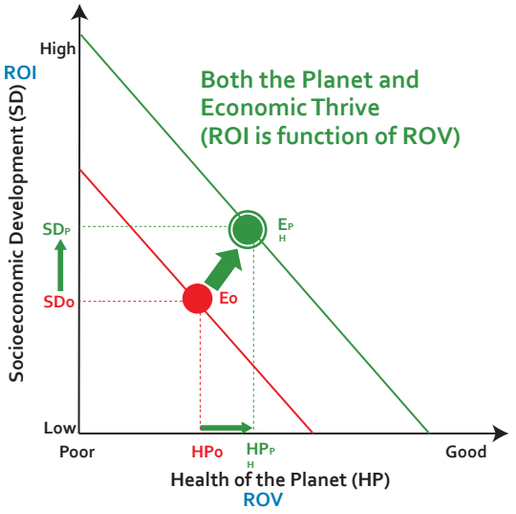


Figure 1-3: Sustainable Planet-Friendly Development Model

Source: Nair, Ahmed and Vaithilingam (2022)

In response to these escalating challenges, driven by our current zero-sum culture, we urgently need to rethink how we define progress. This means shifting from a narrow focus on *profit maximisation* (ROI) to a more balanced model of *purpose optimisation*, where value is measured by return on values (ROV) for everyone involved, including businesses, communities, workers and the environment (see Figure 1-3). It involves making decisions and running organisations in ways that prioritise meaningful, positive impact, not just making money.

Unlike the way we currently operate, the ROV approach focuses on sharing prosperity. It gives equal weight to protecting the environment, ensuring fairness in society and safeguarding the rights of future generations. This way of working reflects the core values of the SDGs and brings the idea of planetary boundaries into everyday planning. It encourages governments, businesses and communities to make decisions that respect the limits of our planet.

This new approach challenges us to think again about what success looks like—not just in terms of money or growth, but through creating shared benefits, protecting the environment and improving the quality of life for everyone. Crucially, ROV and ROI are not

in conflict. In fact, they support each other. Doing the right thing for people and the planet often leads to stronger, more sustainable returns over time – for business and society alike. For example, the transition from fossil fuels to renewable energy will deliver cleaner and more affordable energy in the long term. This shift will enhance cost efficiency and boost firm profitability, while also significantly reducing greenhouse gas emissions.

When nations and organisations come together around a shared purpose, they can build systems that protect the planet and generate lasting prosperity. However, we tend to overlook how closely human progress and environmental health are connected and this disconnect has led humanity down the unsustainable path we are currently following.

As shown in Figure 1-4, many high-income countries have made strong progress in areas such as education, healthcare and wealth. However, this progress has often come at the cost of overusing natural resources, leading them to exceed multiple planetary boundaries despite their advanced socioeconomic development. Worryingly, many developing nations are now following the same path; chasing economic growth while damaging the environment.

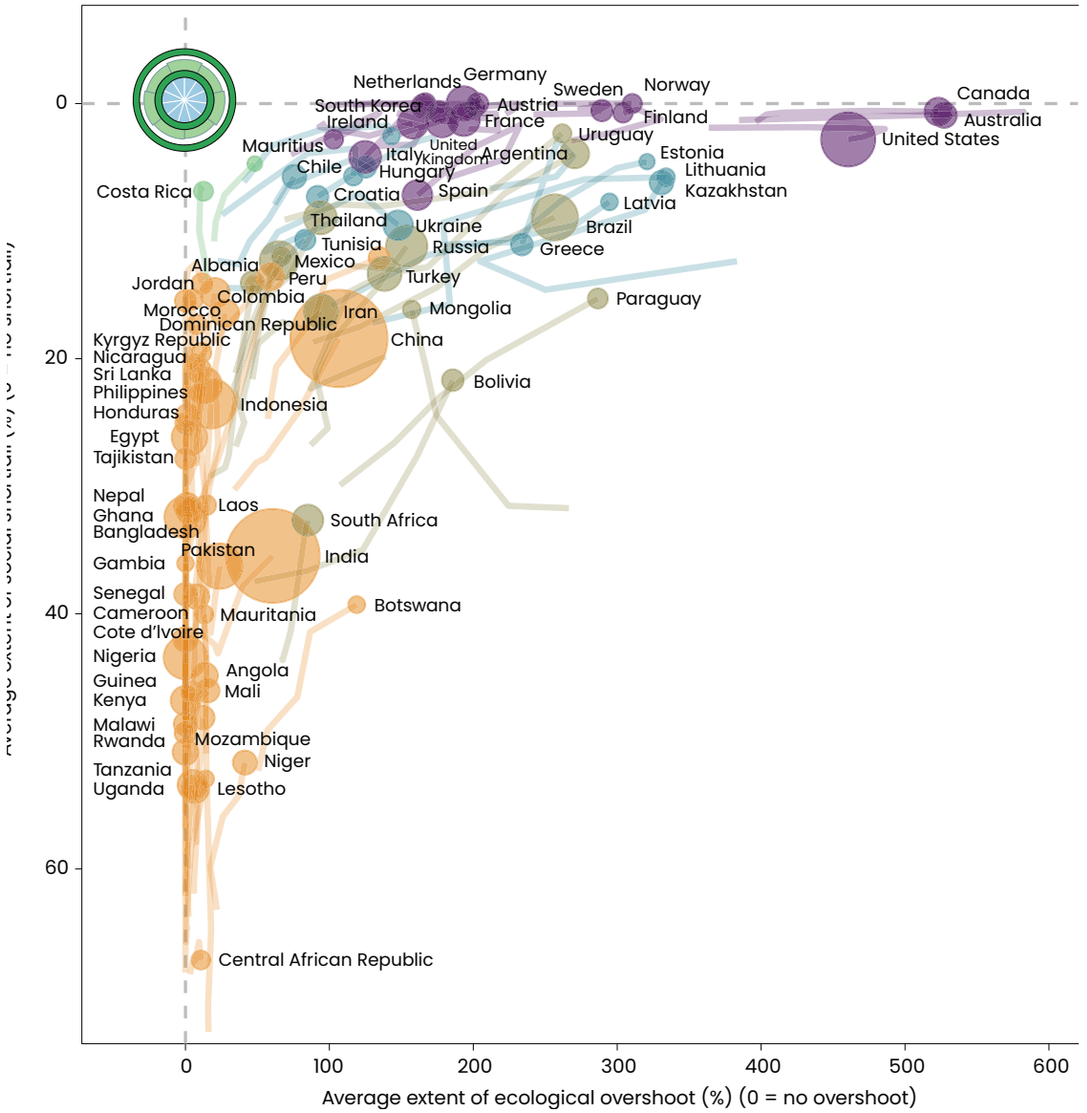


Figure 1-4: Zero-Sum Model: Development vs Planetary Boundaries

Notes: The ideal state for countries lies in the top-left corner, (0, 0), where all the key social indicators (socioeconomic development metrics) are met without overshooting ecological thresholds (planetary health boundary conditions).

Source: Fanning et al., (2022).

If we want a liveable future, this approach needs to change. How we conceive of and pursue development must be redesigned to put people's health and wellbeing at the centre. Protecting nature, our shared life-support system, is therefore not optional; it is essential. Real progress must be built on a foundation of ecological integrity, with environmental responsibility built into every decision we make.

A development model based on shared values can only function if we adopt a Whole-of-Nation approach—where people, whether employers or employees in government, businesses, universities, or other sectors and as members of their communities work together to protect and harness the value of our natural ecosystems.

To bring this vision to life, we need visionary leadership, clear and coherent policies and governance which integrate environmental goals with economic and social priorities. Only by making these deep changes can we build a future that is fair, resilient and truly sustainable—for ourselves and for those who will follow us.

As a native American proverb aptly reminds us: *"We do not inherit the Earth from our ancestors; we borrow it from our children."*

1.3 Malaysia's Planetary Health Boundaries: The Evidence

Like many other developing nations, Malaysia embarked on an ambitious economic development plan in the mid-1980s to accelerate industrial growth and raise national income. While this strategy brought strong economic progress, especially between 2000 and 2019, it often came at a high cost to our environment.

As shown in Figure 1-5 Malaysia's economic growth during this period was not matched by corresponding progress in science, technology and innovation (STI) nor by improvements in overall quality of life. At the same time environmental conditions steadily deteriorated. This shows that Malaysia has largely followed a development path shaped by a "zero-sum" mindset—one where increases in economic wealth have largely come at the expense of the country's natural heritage, or khazanah. In other words, rising GDP has not necessarily translated into healthier, more sustainable, or more equitable lives for Malaysians.

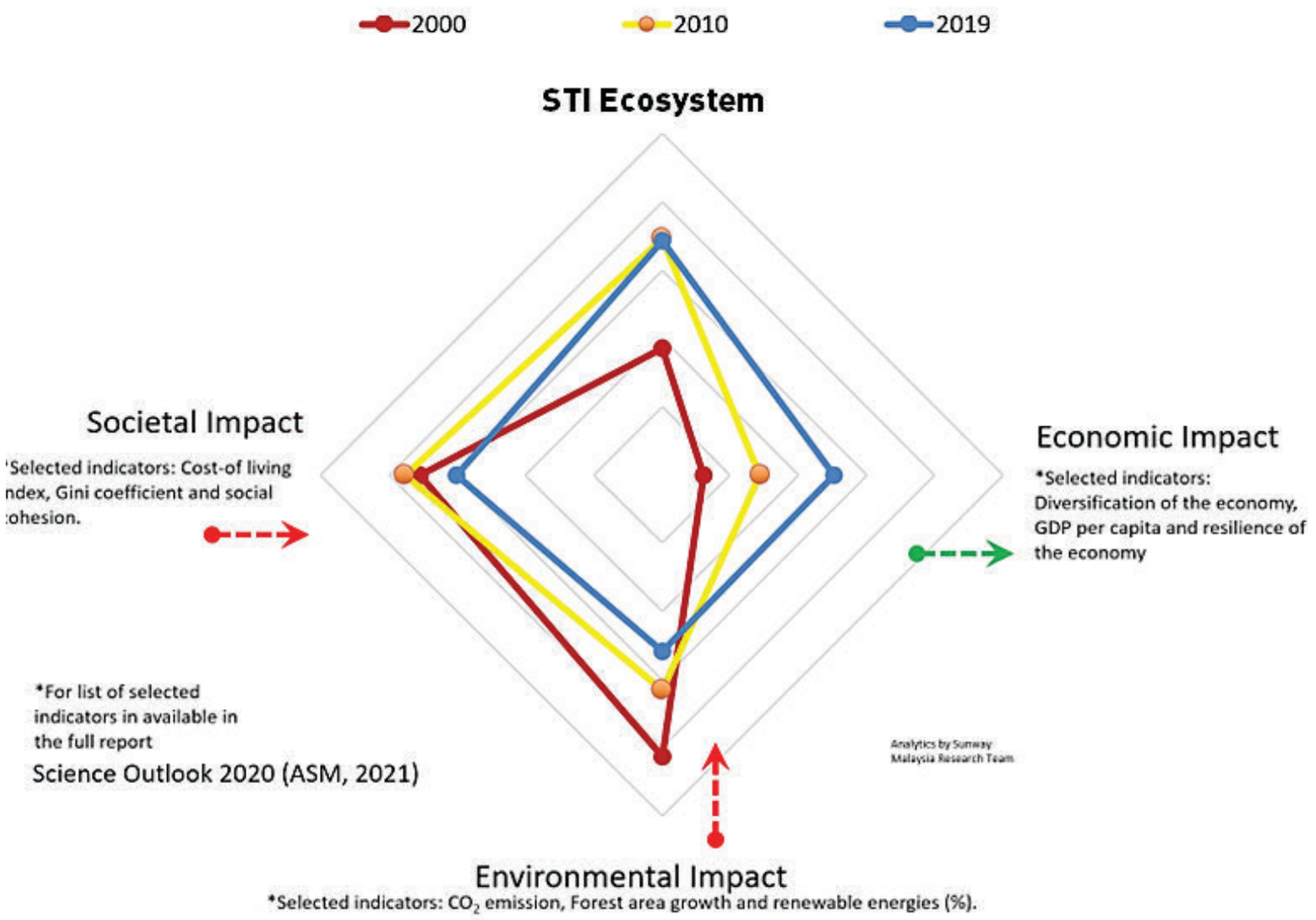


Figure 1-5: State of Development of the STIE Ecosystem in Malaysia.
Source: ASM (2021), Science outlook

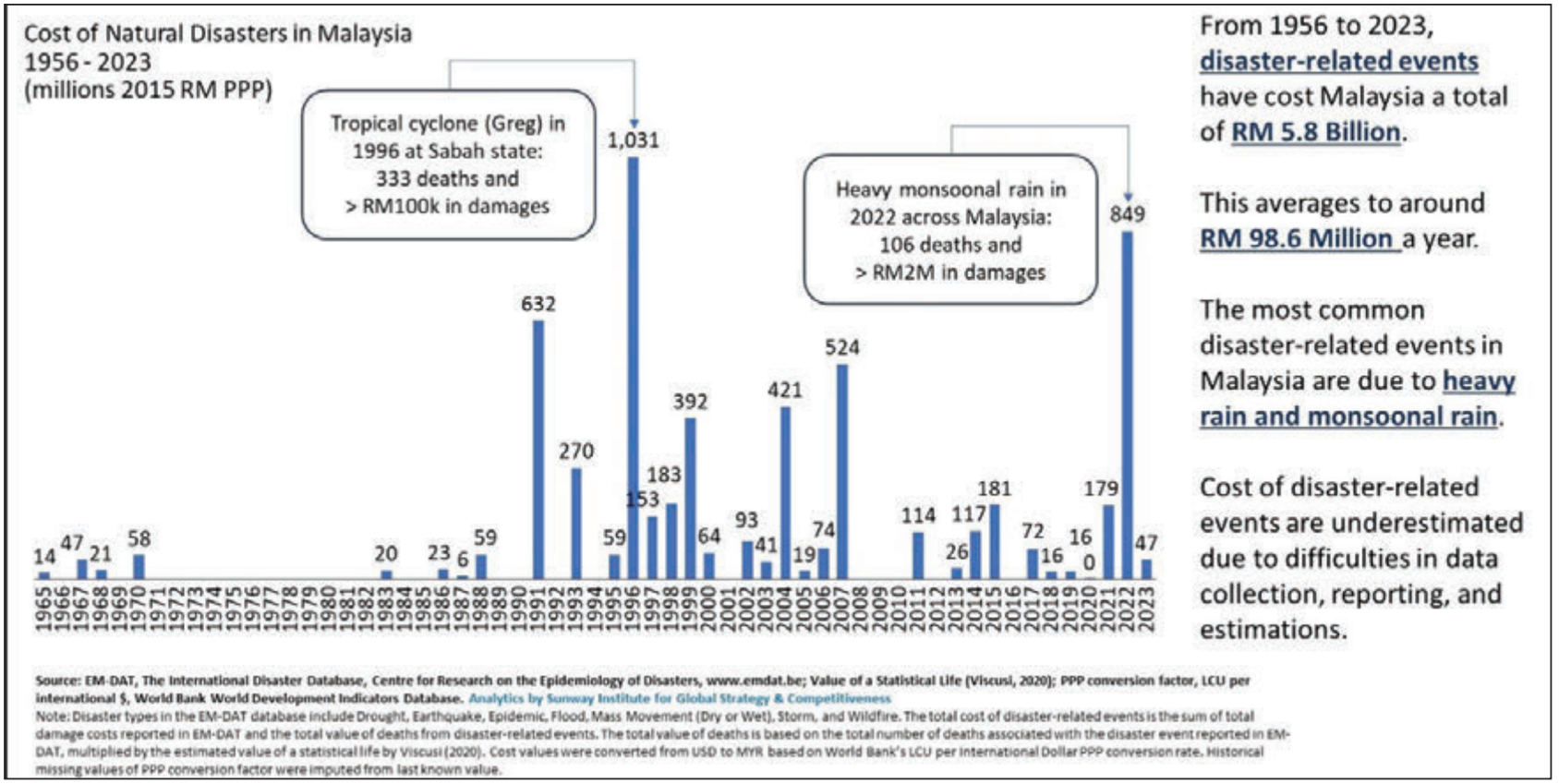


Figure 1-6: Cost of Disasters in Malaysia from 1956 to 2023

These unsustainable practices have had profound consequences, particularly in the form of more frequent severe weather events that trigger disasters. As shown in Figure 1-6, the number of disasters, primarily flooding, began rising in the 1990s and has increased over the past three years. Between 1956 and 2023, disasters cost Malaysia an estimated RM5.8 billion, with RM1.1 billion (or 19 percent) incurred between 2021 and 2023 alone.

In addition, premature deaths linked to environmental factors have increased over the years (Figure 1-7). Five major causes—air pollution from fine particles, lead exposure, harmful substances in the workplace (including gases and fumes), extreme temperatures and unsafe water—account for nearly 88 percent of the total welfare cost associated with premature deaths (Figure 1-8). These figures reflect the growing impact of environmental degradation on public health and overall well-being.

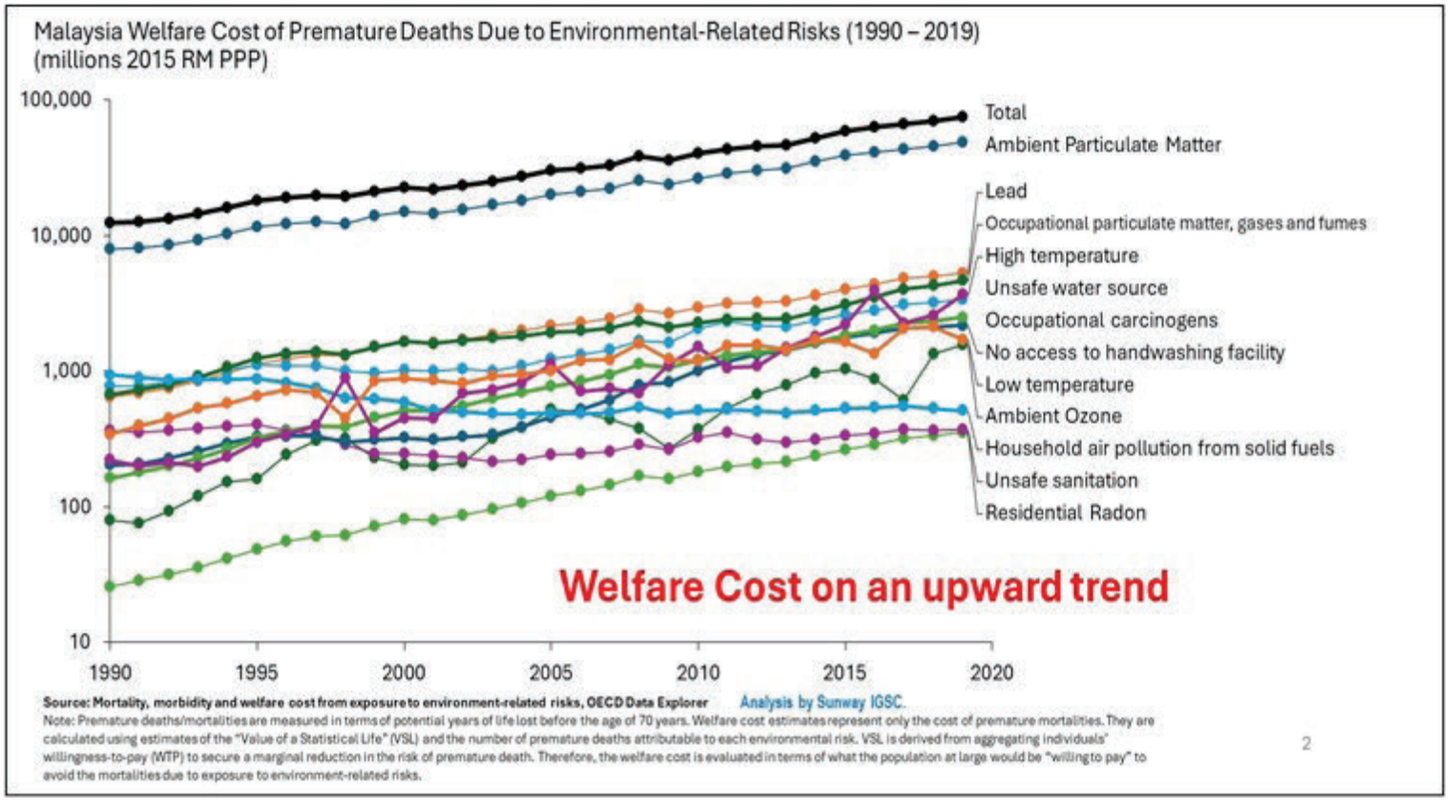


Figure 1-7: Welfare Costs of Environment-Related Premature Deaths in Malaysia (1990–2019)

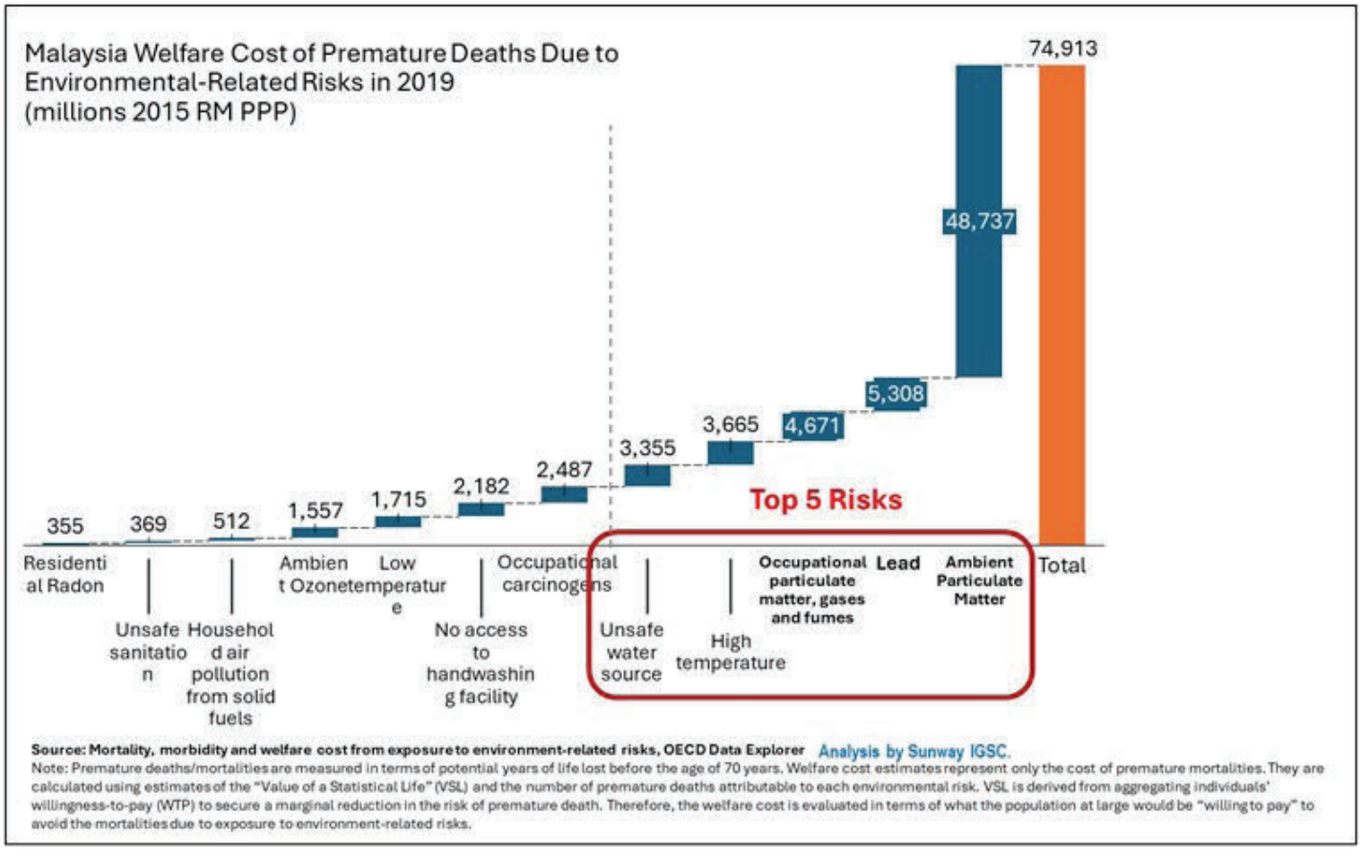


Figure 1-8: Major Drivers of Malaysia Welfare Cost of Premature Deaths Due in 2019

Malaysia's performance against planetary boundaries highlights the unsustainability of its current development model. As shown in Figure 1-9, by 2011 Malaysia had already exceeded six out of seven key environmental limits while meeting only 4 of 10 basic social targets. A study by Fanning et al. (2022) projects that, if the current approach to managing the economy continues, Malaysia will continue to breach these six boundaries over the next 25 years, with increasingly severe consequences (Figure 1-10). These environmental overshoots will have knock-on effects on key social indicators, including health, equality and quality of life, further undermining the country's development progress.

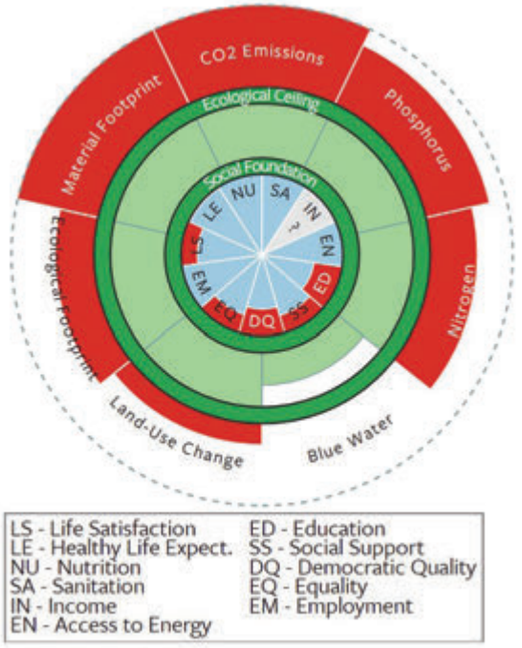


Figure 1-9: State of the Planetary Health Boundaries and Social Foundations in Malaysia (2018).

Data Source: https://goodlife.leeds.ac.uk/national-snapshots/countries/#Malaysia

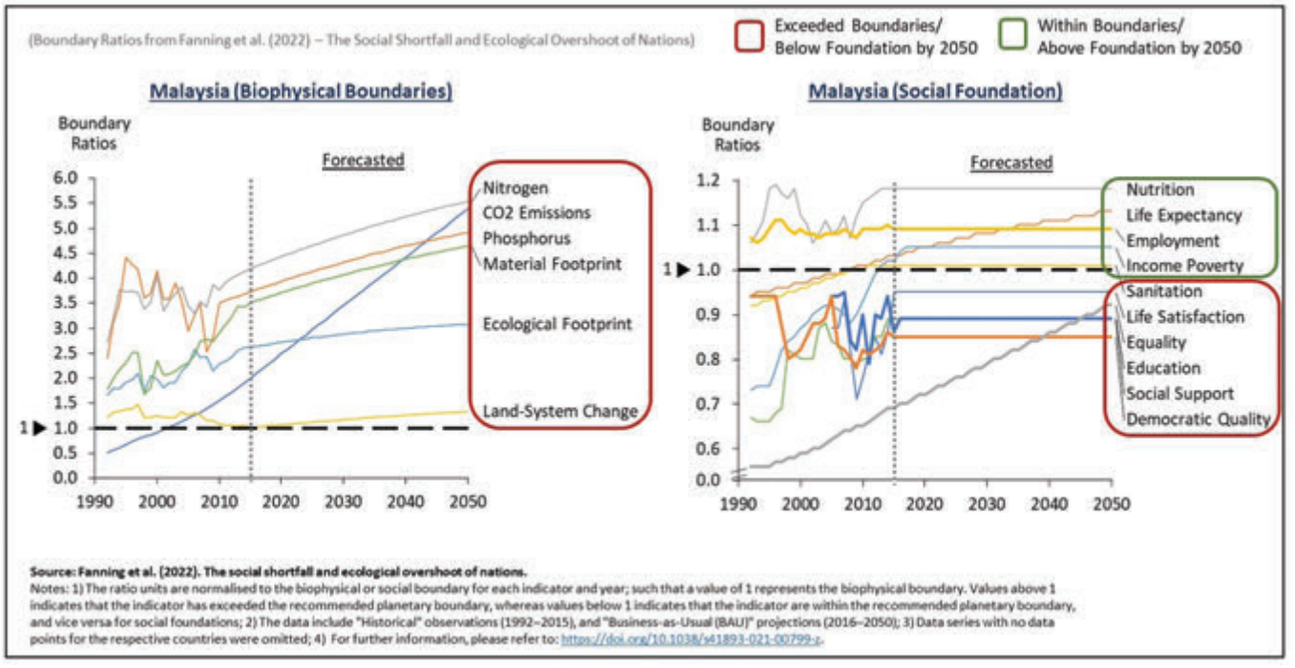
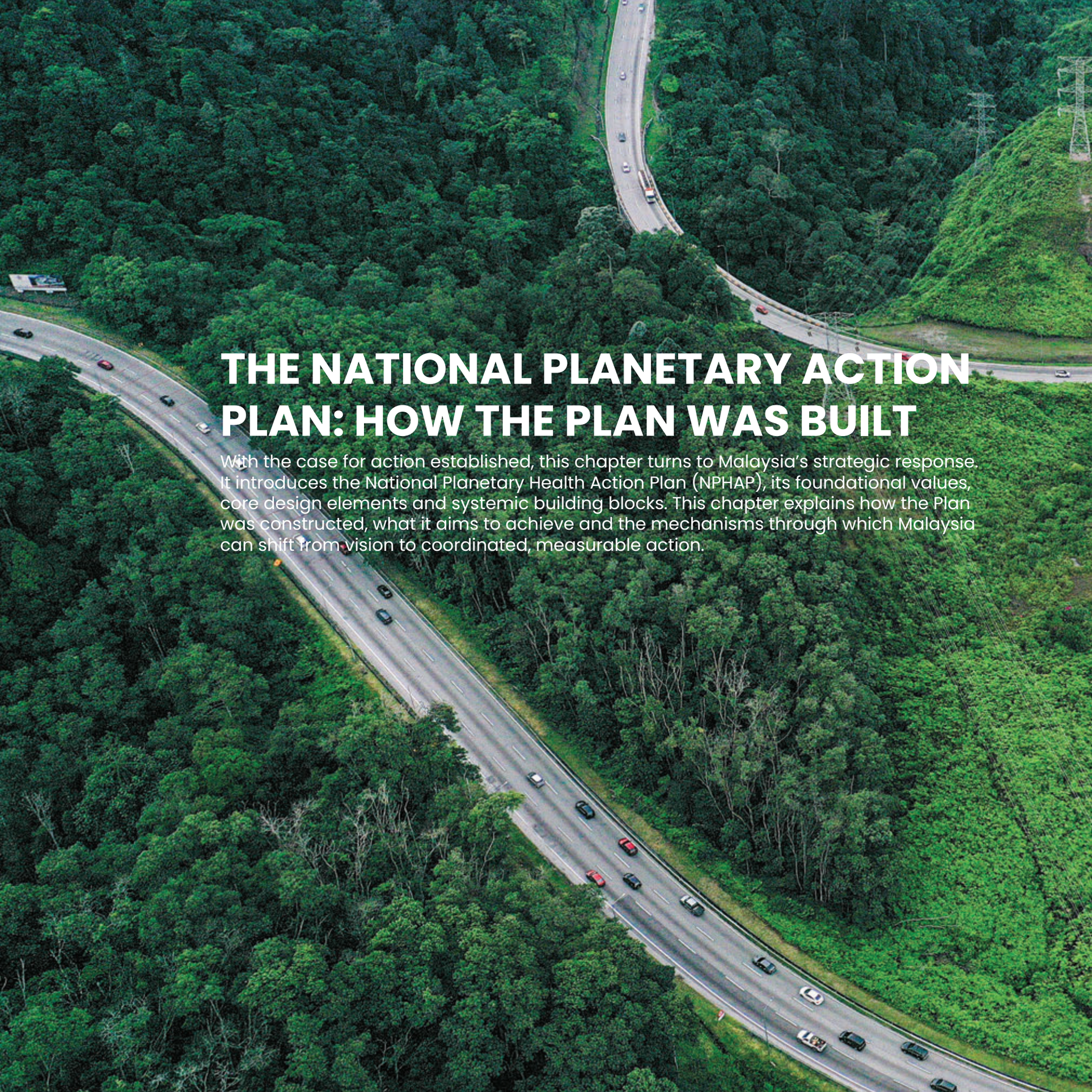


Figure 1-10: Projected Trajectory on Planetary Boundaries and Social Foundations - 1990 to 2050.



THE NATIONAL PLANETARY ACTION PLAN: HOW THE PLAN WAS BUILT

With the case for action established, this chapter turns to Malaysia's strategic response. It introduces the National Planetary Health Action Plan (NPHAP), its foundational values, core design elements and systemic building blocks. This chapter explains how the Plan was constructed, what it aims to achieve and the mechanisms through which Malaysia can shift from vision to coordinated, measurable action.

2.1 Guiding Principles: Humanity-Centric, STI-Enabled, Values-Driven

The National Planetary Health Action Plan (NPHAP) is Malaysia's strategic commitment to restoring planetary health, safeguarding the well-being of the Rakyat and enhancing national prosperity through the creation of nature-based industries and green jobs. This transformative plan is built on four guiding principles:

1. **Humanity-Centric—For Humanity, By Humanity:** This principle puts people at the heart of all development. It calls for decisions and policies to be shaped by empathy, fairness and a shared sense of responsibility, across all generations. For example, designing public transport that is accessible to the elderly and people with disabilities, ensuring clean water for rural communities, or creating job opportunities that support family well-being, not just economic output.

2. **Science, Technology and Innovation for a Planet-Positive Future:** Science, technology and innovation (STI) must drive Malaysia's shift towards sustainable, inclusive and future-ready development. This means investing in solutions that protect the environment, strengthen resilience and serve all segments of society. For example, using satellite technology to monitor deforestation, applying AI in healthcare to improve early disease detection, or supporting local start-ups working on renewable energy or climate-smart agriculture.

3. **Nature-Based Development - Planet First, People Always:** Malaysia's natural treasures—its forests, rivers, coasts and biodiversity—are not just part of our heritage, but vital to our future. Protecting and restoring nature is not a cost, but a smart investment in prosperity, national identity and global relevance. For example, prioritising forest conservation to reduce flood risks, integrating green spaces in urban planning to support mental health, or building eco-tourism models that benefit local communities while preserving ecosystems.

4. **Values-Internalised: Rooted in Universal Spiritual Values, United in Diversity:** Development must be guided by the spiritual and cultural values that reflect who we are as Malaysians—compassion, unity, respect for others and care for the Earth. These values are enshrined in the Pillars of the Nation, or National Principles (Rukun Negara[1]) and lived through daily practice. For example by respecting differences in beliefs and cultures, practicing honesty and fairness in business, volunteering time or resources to support community welfare, or reducing waste out of care for future generations.

Guided by its four principles, the NPHAP takes an integrated and collaborative approach, mobilising resources and aligning efforts across communities, government, academia and the private sector. The goal is to generate greater ROV by embedding the best planetary health practices into national development.

As illustrated in the previous section, this marks a clear and urgent departure from the old "zero-sum" development model. Instead, the NPHAP promotes a "planet-positive" pathway, where economic prosperity, human wellbeing and environmental protection reinforce rather than undermine each other.

At its core, the NPHAP seeks to maximise Return on Values (ROV) by integrating sustainability into all levels of policy, planning and action. The NPHAP framework is anchored on:

- Six Key Result Areas
- Five Systemic Shifts
- Fifty-three Strategies
- Two hundred and twenty-four Action Plans

[1] Rukun Negara is Malaysia's national philosophy, introduced in 1970 following the racial riots of May 13, 1969. Its purpose is to promote unity, national identity and a shared set of values across Malaysia's diverse population. In Malay, *"Rukun Negara"* literally means "National Principles" or "Pillars of the Nation." It consists of five core principles: (i) *Kepercayaan kepada Tuhan* – Belief in God, (ii) *Kesetiaan kepada Raja dan Negara* – Loyalty to King and Country (iii) *Keluhuran Perlembagaan* – Supremacy of the Constitution (iv) *Kedaulatan Undang-undang* – Rule of Law, (v) *Kesopanan dan Kesusilaan* – Courtesy and Morality. These principles aim to guide the behaviour and mindset of all Malaysians in building a peaceful, just and united society.

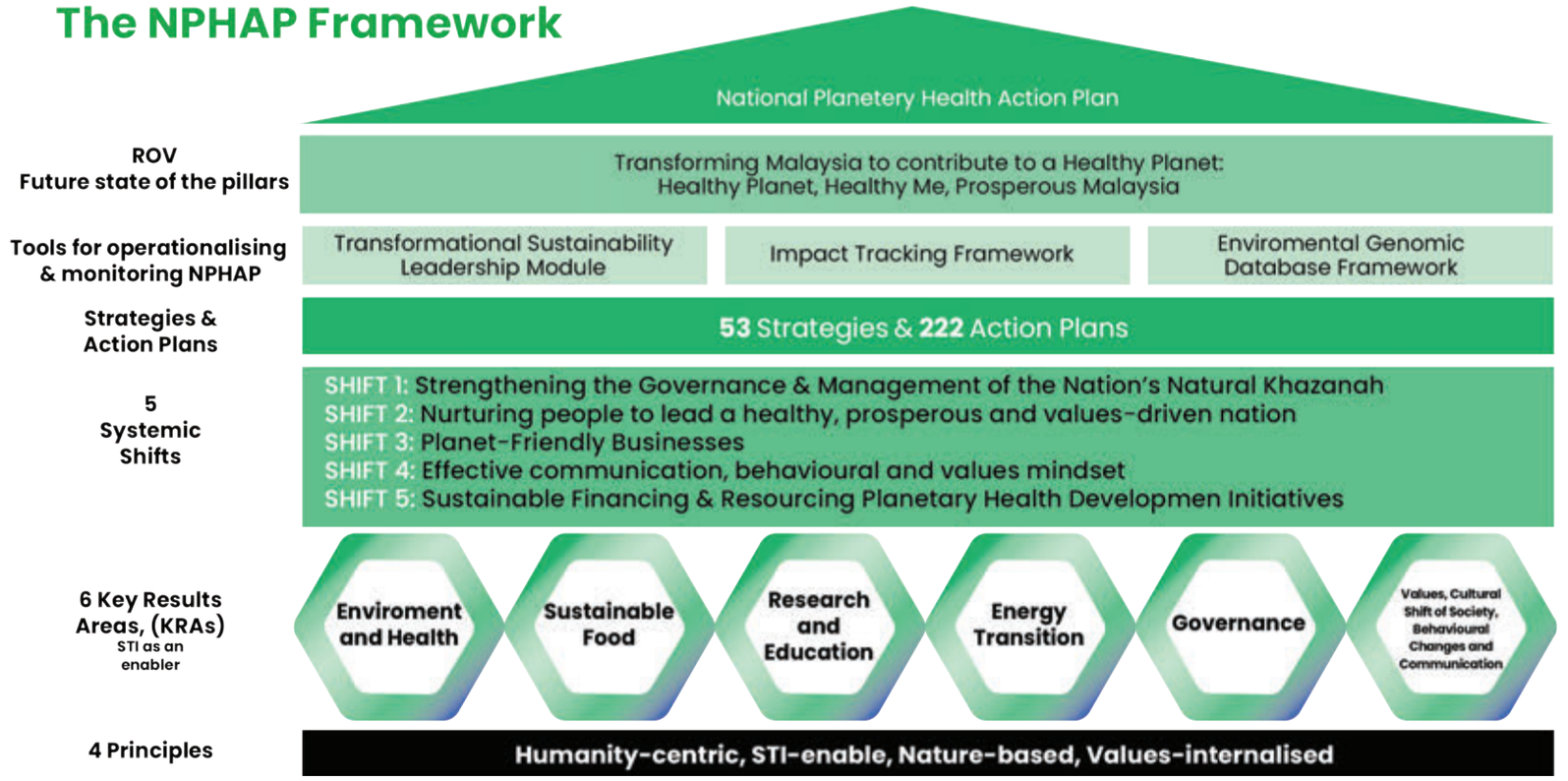


Figure 2-1: The National Planetary Health Action Plan Framework

The plan provides tools to operationalise these strategies, monitor implementation and evaluate performance, using metrics such as ROV and Malaysia's contribution to global planetary health. These elements provide a structured and dynamic roadmap for driving and tracking sustainable progress.

The full NPHAP framework is summarised in Figure 2-1.

Importantly, the NPHAP does not introduce new mandates or rules. Instead, it proposes ways to strengthen existing systems of governance, promoting a new era of collaboration, coordination and cross-sectoral cooperation. The plan supports the growth of knowledge and skills that will position Malaysia as a regional leader in nature-based solutions and the green economy.

By empowering stakeholders and embedding best practices in planetary health, the NPHAP will create mechanisms that make resilience, innovation and environmental responsibility part of everyday policy- and decision-making. It promotes active participation in planetary health initiatives and sets out clear systems for accountability and compliance. Strategic investments will strengthen Malaysia's science, technology, innovation and economy (STIE) ecosystem, build more resilient local supply chains, and boost the country's global competitiveness.

At its core, the NPHAP aims to drive systemic change through a Whole-of-Nation approach that promotes inclusive participation and shared benefits across all states, sectors and communities. This aligns closely with the Malaysia MADANI development framework, ensuring that no one is left behind.

2.2 Changing Mindsets, Shaping Systems: Advancing Planetary Health

As we have seen, the NPHAP highlights the need for a fundamental mindset shift as the foundation for real and lasting progress in planetary health. It recognises that human well-being and the health of the planet are deeply connected and puts forward a new way of thinking about our relationship with Earth's natural systems.

Achieving this shift requires greater investment in education, public awareness and skills development. These are key to building the leadership and technical expertise needed to tackle the complex challenges of planetary health. As global environmental pressures intensify, Malaysia must be future-ready, with the people, tools and systems to respond to emerging environmental and health risks. To turn this vision into structured, measurable action, the NPHAP introduces three key mechanisms (Figure 2-1). These will help embed planetary health principles across government, research and daily life—making sustainability a core part of how the country is governed and how society operates.

The Transformational Sustainability Leadership Module (TSLM)

The Transformational Sustainability Leadership Module (TSLM) aims to strengthen the knowledge and skills of public officials, institutional leaders and other key players. The goal is to promote a new way of thinking; one that puts the health of the planet at the centre of decision-making.

This module helps leaders understand how their choices affect the environment and encourages ethical, long-term thinking. Strong leadership is seen as the most powerful driver of real, lasting change. Through the TSLM, Malaysia aims to lead by example in how it governs for planetary health.

Environmental Genomic Database Framework

This framework uses the latest science to explore the links between nature, biodiversity and human health. By building a detailed DNA database of Malaysia's plants, animals and microbes, it supports research, conservation and smarter policymaking. Consolidation of this data enables better decisions on protecting nature, restoring ecosystems and managing diseases—especially those that spread from animals to humans—and strengthens Malaysia's ability to respond quickly and effectively to emerging environmental and health threats.

Impact Tracking Framework

To ensure NPHAP implementation is effective and accountable, the plan includes an Impact Tracking Framework— a clear, structured system to measure progress, learn from experience and make continuous improvements. It equips government, business and communities with tools to monitor results and adjust actions as needed. By using real data to guide decisions, this framework keeps Malaysia focused on what works, responsive to change and committed to a healthier, more resilient future.

These three mechanisms are described in greater detail in Chapter 4.

2.3 The NPHAP Conceptual Framework and Methodology

Having set out the need for a shift in development logic, this next section details the thinking behind the Plan: how it was built, whose voices were included, and which conceptual frameworks will guide implementation and accountability. This methodology is based on the understanding that Malaysia's national priorities and the health of the planet are linked and must be addressed together.

The Six Key Results Areas:

At the heart of the National Planetary Health Action Plan (NPHAP) are six Key Result Areas (KRAs) that serve as strategic entry points for systemic transformation. These KRAs are:

1. Governance
2. Environment and Health
3. Sustainable Food
4. Research and Education
5. Energy Transition and,
6. Values, Culture, Behaviour Change and Communication

These are the key areas where Malaysia must act to stop ecological decline, protect public health and ensure long-term prosperity. Identified through broad consultation, evidence review and systems analysis, these areas are the main levers for making planetary health part of national development.

The KRAs are interconnected, collectively they provide the foundation upon which the Plan's strategies, systemic shifts and action plans are built.

Planetary Health Conceptual Frameworks

Below, we introduce the conceptual framework underpinning the studies, which encompass the planetary health ecosystem, values, dynamic capabilities, return on values, and the integrated sustainable planetary health value chain.

The 8I Enabling Framework

The methodological progression began by breaking down how the six Key Result Areas (KRAs) interact with each other, using the Planetary Ecosystem – 8I Framework (Figure 2-2) as the analytical basis for this work.

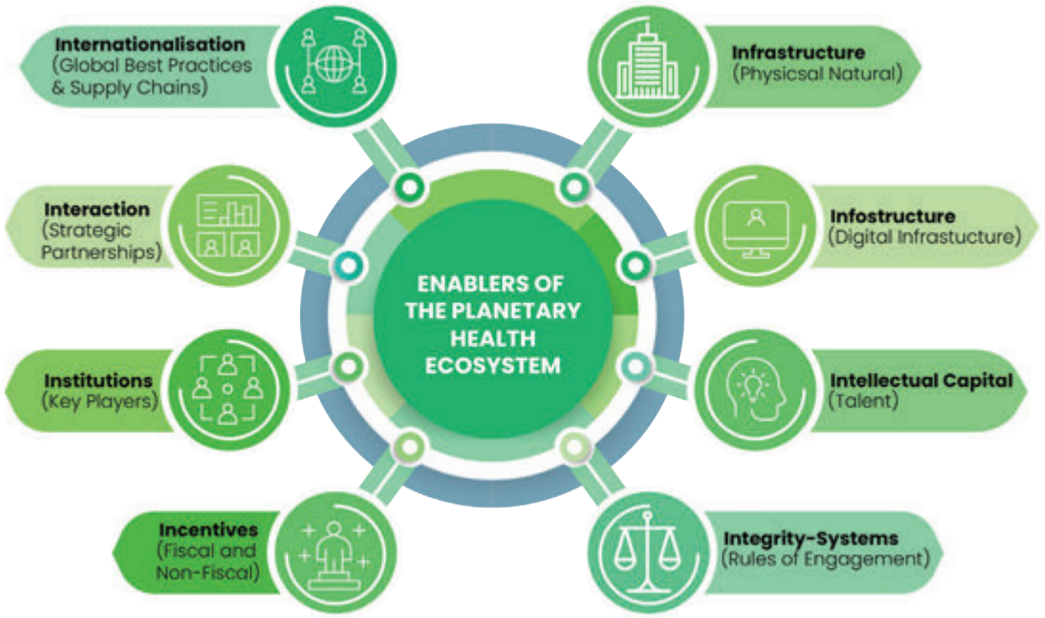


Figure 2 2: Planetary Health Ecosystem – 8I Framework
Source: Nair, Ahmed and Vaithilingam, 2022a

This framework was used to assess each KRA through the lens of eight systemic enablers (or key factors) that support change across the entire system:

- Infrastructure: Physical and natural ecosystems that support development.
- Infostructure: Systems for managing data, knowledge and information.
- Intellectual Capital: The skills, expertise and talent needed for progress.
- Integrity Systems: Governance, transparency and accountability structures.
- Incentives: Financial and non-financial support to encourage sustainable practices.
- Institutions: The role of public bodies, companies and communities in stewardship.
- Interaction: Partnerships and collaboration across sectors and stakeholders.
- Internationalisation: Meeting global standards and linking with international supply and knowledge networks.

Each of these enablers was analysed across all six KRAs to identify where systems can be better aligned and where change can be most effectively triggered. The eight enablers offer valuable insights into the development status of the six KRAs. This study assessed their strengths and weaknesses and proposed key recommendations to address gaps in the ecosystem.

The Conceptual Framework: The Planet-friendly (8R) Values

To guide this analysis and ensure it reflects deeper values, the methodological process also drew on a nature-centric values framework, known as the 8R values (Figure 2-3). These values express the philosophy behind the plan and include:

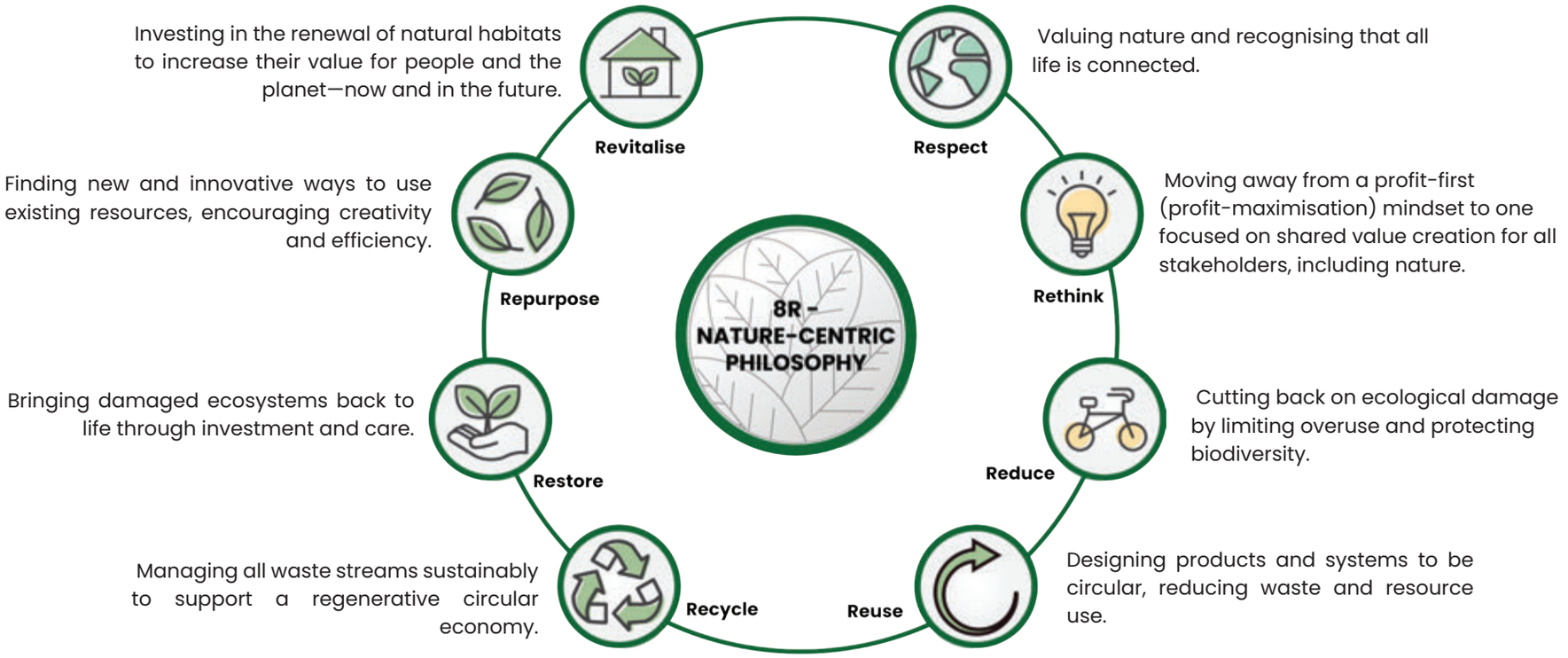
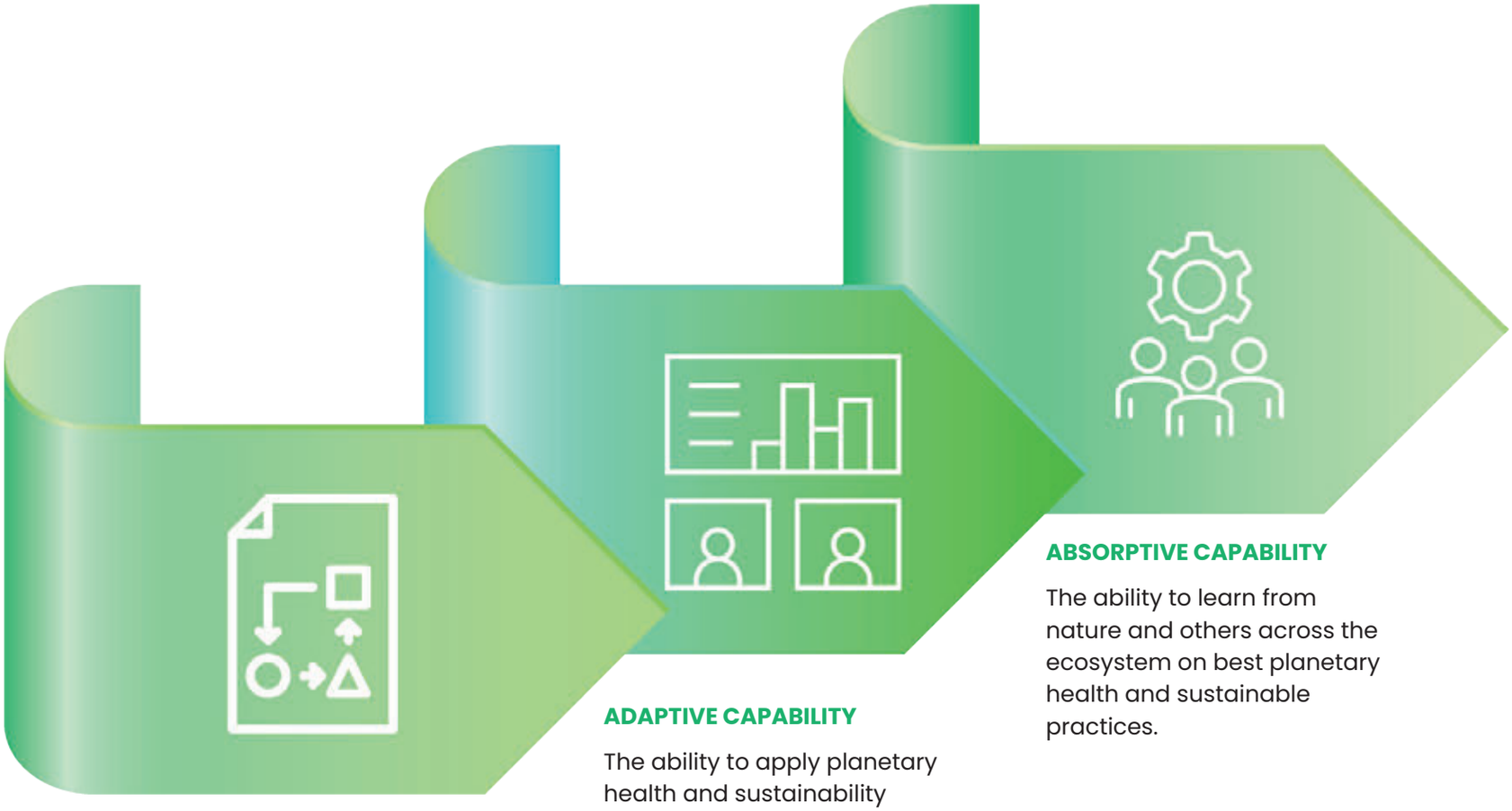


Figure 2-3: The 8R - Nature-centric Philosophy
Adapted from Nair, Ahmed and Vaithilingam, 2022a and 2022b

Dynamic Capabilities:

Understanding that planetary health values must lead to real-world changes in behaviours and institutional practices, the NPHAP introduces the concept of Planetary Health Dynamic Capabilities. This concept refers to how well individuals, organisations and systems can learn from nature, adapt to change and develop new, nature-based solutions.

There are three core capabilities in this model (Figure 2-4):



INNOVATIVE CAPABILITY

The capability to invest in research and development that creates nature-based innovations and delivers value to all stakeholders.

ADAPTIVE CAPABILITY

The ability to apply planetary health and sustainability best practices from a broad variety of sources to enhance corporate performance, drive industrial development, improve people's lives and support nation-building.

ABSORPTIVE CAPABILITY

The ability to learn from nature and others across the ecosystem on best planetary health and sustainable practices.

Figure 2-4: Planetary Health Dynamic Capability
Adapted from Nair, Ahmed and Vaithilingam (2022)

Dynamic capabilities are key to making the future workforce, firms and organisations more competitive and resilient, while staying aligned with planetary health principles. Those with strong ability to absorb new knowledge are better placed to adapt and innovate. Building these capabilities creates more value for everyone in the ecosystem and helps the nation climb the global innovation ladder.

The Conceptual Framework: Return on Values

To ensure that planetary health behaviours lead to meaningful impact and generate greater ROV for all the NPHAP outlines four key dimensions of ROV (Figure 2-5).

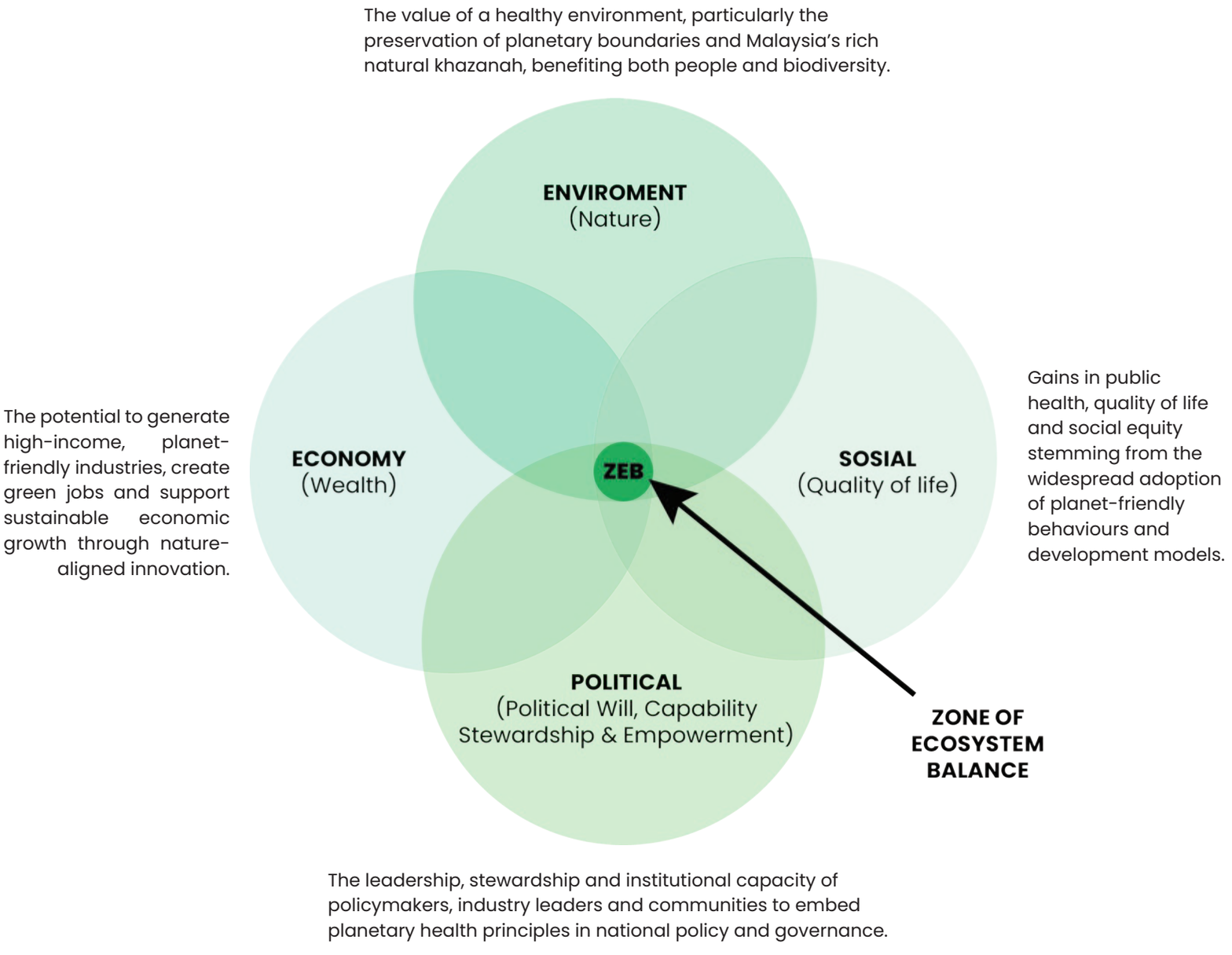


Figure 2-5: Return on Values (ROV) Components

Note: Zone of Ecosystem Balance (ZEB) is the state that all planetary health boundaries are balanced with socioeconomic development; thus, creating a steady sustainable state of development.

Adapted from Nair, Ahmed and Vaithilingam (2022)

A key feature of the NPHAP is its focus on addressing all four components of ROV. This ensures the national development agenda operates within the Zone of Ecosystem Balance, integrating social, environmental and community empowerment considerations into all economic and industrial development efforts.

Integrated Conceptual Framework: The Virtuous Framework for Integrated Planetary Health Development

Bringing these elements together, Figure 2-6 presents the Integrated Planetary Health Development Framework. In this model, communities, businesses and institutions collaborate to invest in the 8I enablers, which are aligned with the 8R planet-friendly values. As organisations strengthen these enablers, they gradually build nature-based dynamic capabilities. This, in turn, drives greater investment in green infrastructure, talent and governance systems; key to delivering ROV for all stakeholders by creating planet-friendly jobs, supporting industrial development and improving the quality of life in local communities.

As these values take root, a positive feedback loop is created. Resources gained from better outcomes can be reinvested to further strengthen the system. This integrated and virtuous cycle is essential for reaching and maintaining the Zone of Ecosystem Balance, where economic and social progress go hand in hand with planetary health. This integrated planetary framework is applied to each KRA through focus group discussions (FGDs) and firm-level surveys.

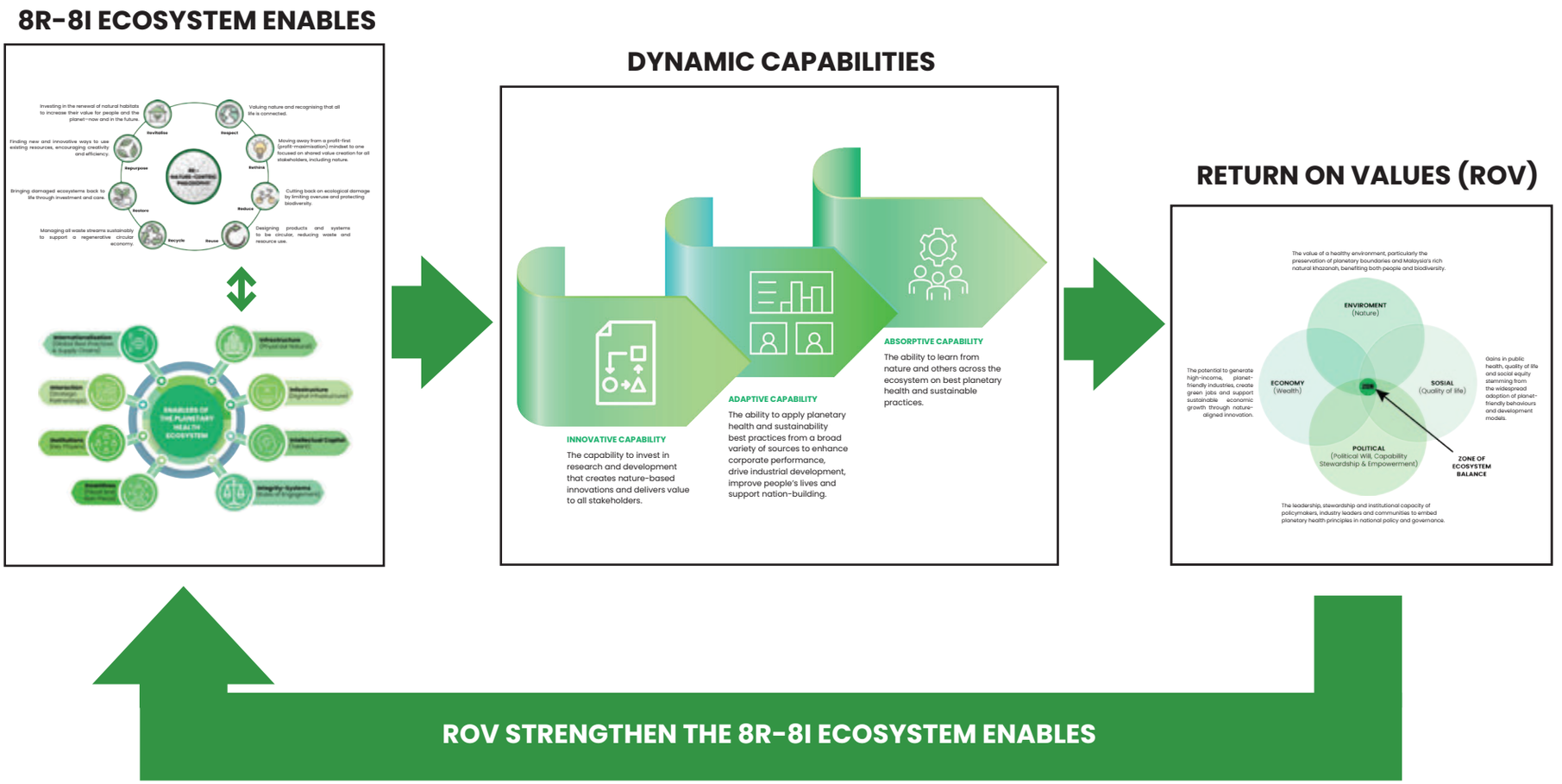


Figure 2-6: Integrated and Sustainable Planetary Health Value Chain

The Methodology - Ten-Step Engagement Process

The methodology followed a structured 10-step process designed to identify the strengths and gaps in ecosystem enablers across the KRAs. Insights from this process were used to translate national and planetary health goals into practical strategies. Each step played a key role in shaping the plan's direction and identifying leverage points for meaningful, system-wide change. The information collection methods used for each step are outlined below in Figure 2-7.

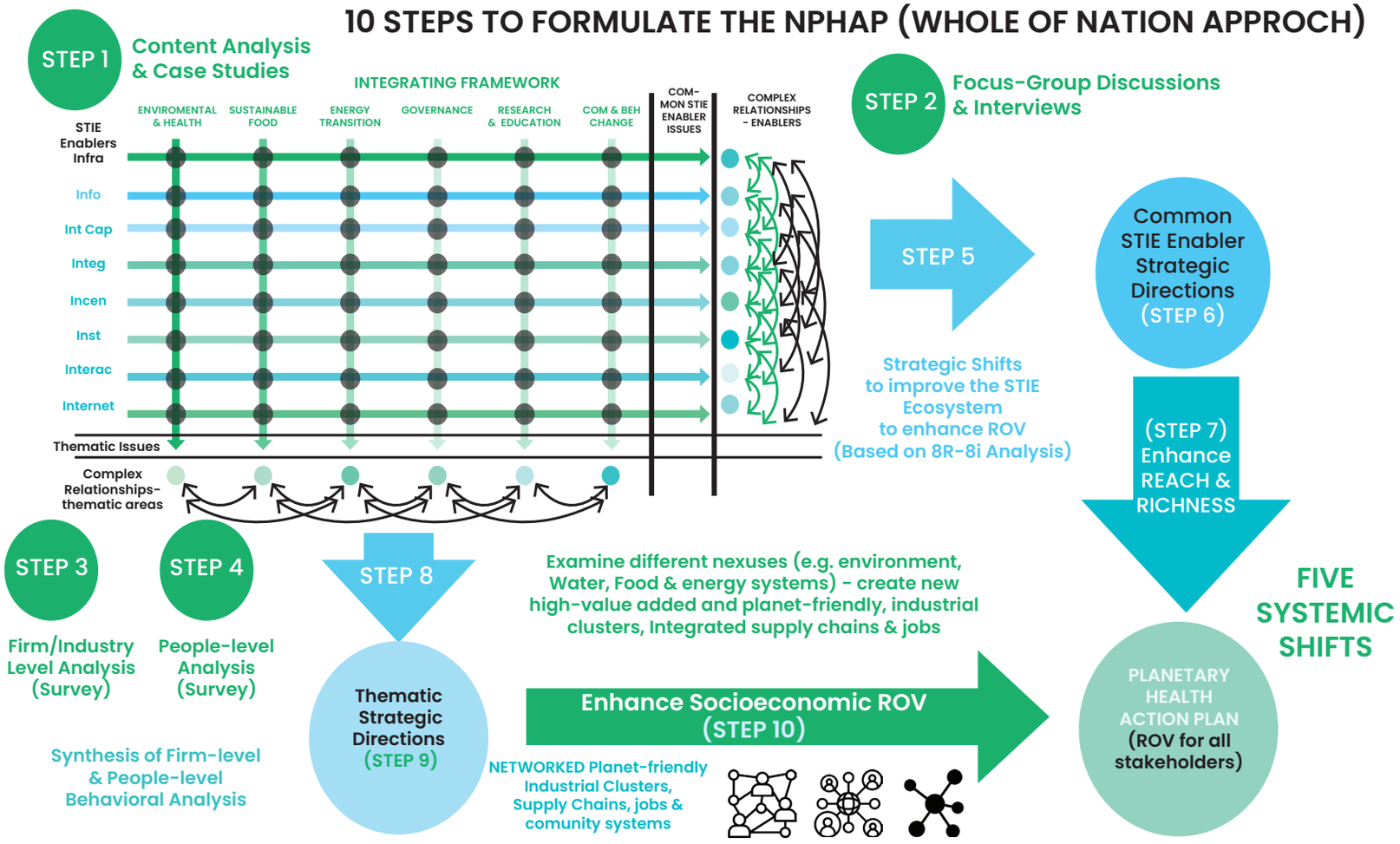


Figure 2-7: The Stepwise Process Used to Develop the National Planetary Health Action Plan (The arrows to be just one large bracket)

Step 1 - Content Analysis and Case Studies: Reviewed key case studies and analysed content across the six KRAs—Environment and Health, Sustainable Food, Energy Transition, Governance, Research and Education and Communication and Behavioural Change—to identify critical STIE enablers. These six KRAs were identified through consultations with key government agencies and industry players in the blue economy sectors.

Step 2 - Focus-Group Discussions and Interviews: Held targeted discussions and stakeholder interviews to explore the complex links between enablers and real-world across sectors, industries and communities.

Step 3 - Industry-Level Analysis: Conducted surveys to understand how businesses/firms of different sizes across various sectors engage with the STIE ecosystem, focusing on thematic enablers and their contribution to planetary health and ROV. In this context, the survey explores the challenges firms face in implementing planetary best practices and identifies strategies to strengthen the corporate ecosystem, enhancing their contribution to ROV for all stakeholders.

Step 4 - People-Level Analysis: Conducted nationwide surveys to assess public awareness, behaviours and values around planetary health and sustainability, offering insights into the population's readiness for change.

Step 5 - Integration of Firm and People-Level Insights: Combined data from both levels to understand how people and businesses interact with ecosystem enablers. This helped identify leverage points for policy and programme design, using the 8R–8I ecosystem framework.

Step 6 - Strategic Directions for STIE Enablers: Mapped the interactions between stakeholders to draw out shared strategic directions. The focus was on improving critical enablers such as incentives, governance and infrastructure.

Step 7 - Bridging Capability Gaps: Identified weaknesses in key sectors including ICT, finance and professional services and aligned their development with long-term national goals for planetary health. These development initiatives aim to expand the reach and depth of industries adopting planet-friendly and sustainable best practices, enabling them to benefit from network externalities and multiplier effects.

Step 8 - Nexus Analysis: Assesed the key enablers that strengthen linkages between the KRAs. The insights inform cross-KRA development initiatives that promote the creation of planet-aligned industrial platforms, clusters and supply chains.

Step 9 - Thematic Strategic Decisions: Developed cross-cutting strategies to foster innovation, collaboration and systemic integration across thematic pillars, helping to build future-ready, sustainable industries.

Step 10 - Enhancing Socioeconomic ROV: Promoted cross-sector collaboration to scale up sustainable industries and job creation—particularly in energy, services and governance—while preserving Malaysia's natural khazanah for future generations.

This 10-step approach identifies gaps in the ecosystem enablers and outlines strategies to address them. Crucially, the eight enablers are not viewed in isolation but as interrelated components. Strong linkages between them drive five systemic shifts that embed planetary health values across the ecosystem. These shifts position nature as a key driver of Malaysia's socioeconomic development. Further details are provided below. They are essential for increasing ROV, safeguarding ecosystems, and ensuring that Malaysia's development remains inclusive and sustainable for current and future generations.

The Five Systemic Shifts

Before detailing the five systemic shifts required to realise the NPHAP vision, it is important to emphasise the governance principle that underpins their delivery: a Whole-of-Nation approach that mobilises Malaysians towards a shared planetary health agenda.

The NPHAP is grounded in this Whole-of-Nation governance philosophy which recognises planetary health as a shared responsibility across sectors, levels of government and society at large. From its inception, the Plan engaged policymakers, industry leaders, researchers, educators, civil society, local communities and the media, to ensure broad ownership and legitimacy. This approach is not just a feature of how the Plan was developed, but a central tenet of how it must be implemented: through coordinated action, mutual accountability and shared stewardship of Malaysia's natural and social capital.

Thus, this section unpacks the five interconnected systemic shifts that underpin Malaysia's pathway towards the vision of "Healthy Planet, Healthy Me, Prosperous Nation." Together, the shifts form the foundations for development of integrated strategies and action plans that will guide Malaysia towards a sustainable and resilient future.

The five systemic shifts are:

1. Strengthening the Governance and Management of the Nation's Natural Khazanah
2. Nurturing People to Lead a Healthy, Prosperous and Values-Driven Nation
3. Planet-Friendly Businesses
4. Effective Communication, Behavioural Change and Values Mindsets
5. Sustainable Financing and Resourcing for Planetary Health Development Initiatives

The shifts are mapped against the six identified KRAs, supporting an approach that is both integrated and targeted. Their interlinked nature allows for greater collective impact, boosting ROV by creating new, high-value, planet-friendly industries, integrated supply chains and meaningful green jobs.

As part of the process, simulations were run to show how the five shifts affect one another. The results showed that progress in one area can support progress in others, highlighting the need for cross-sector action. Key interactions, like sharing, working together and building synergies are essential for lasting, system-wide change (Figure 2-8).

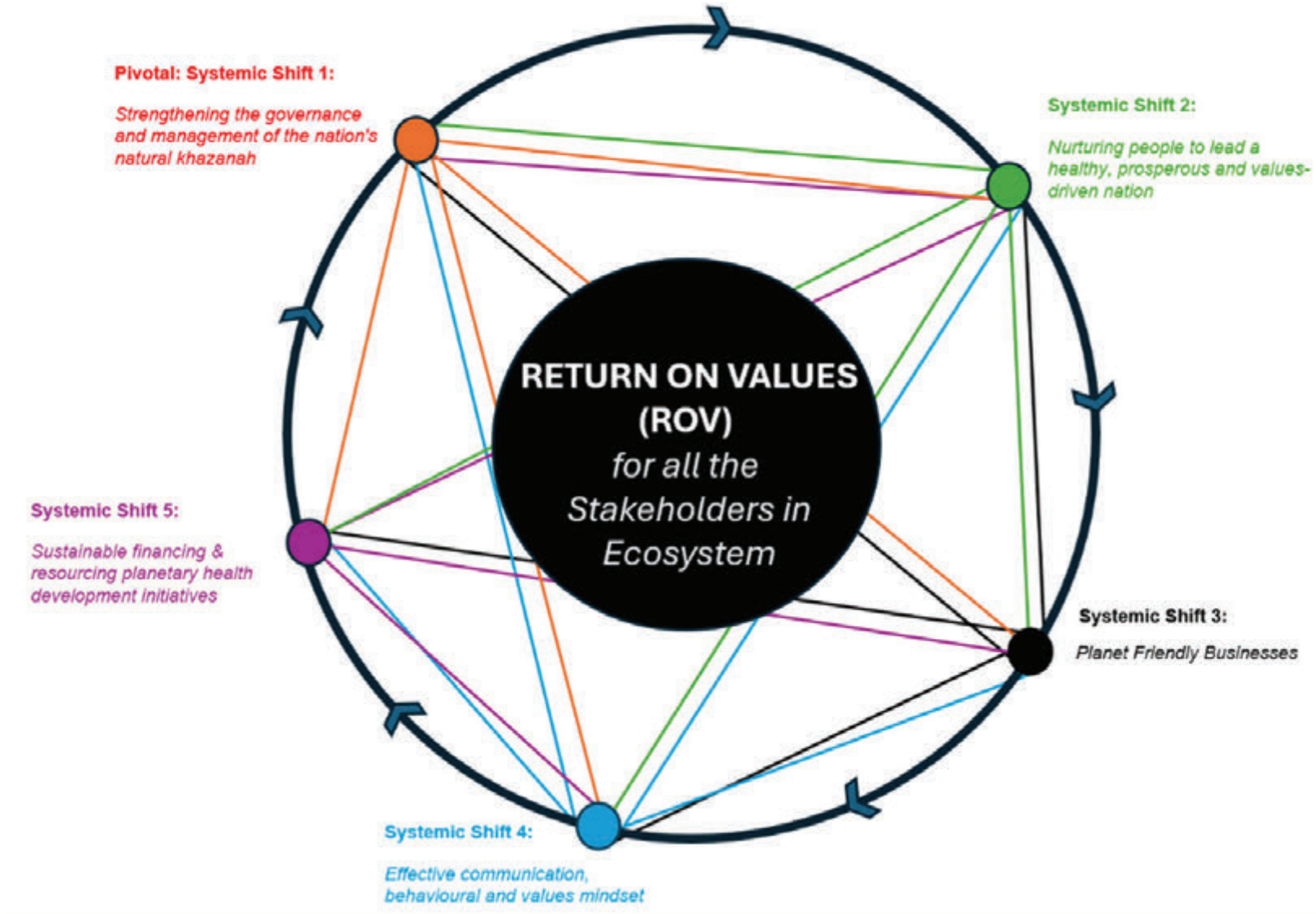


Figure 2-8: ROV for All Stakeholders in Ecosystem.

Demonstrates how Return on Value (ROV) is distributed across sectors in the planetary health ecosystem.

Key insights include:

1. **Systemic Shift 1: Governance is the catalyst.** Strong governance is the starting point for Malaysia's planetary health transformation. Improving how the country manages its natural khazanah creates a ripple effect across the other shifts:
    - It helps identify and match the right skill sets and talent for Shift 2.
    - It supports the creation of business-friendly planetary health policies and incentives for Shift 3.
    - It guides effective communication and public engagement to nudge behaviour change in Shift 4.
    - It lays the groundwork for sustainable financing and economic benefits under Shift 5.

2. **All Five Systemic Shifts are interdependent.** Each shift reinforces and accelerates the others. For example, investing in people and values-driven leadership (Shift 2) builds the talent and capacity needed to enable progress throughout the other shifts.
3. **Interconnections drive higher ROV.** A network of cross-sector synergies creates opportunities to maximise ROV. By connecting value chains, such as Halal supply chains, green finance, ESG advisory services and ICT, Malaysia can drive the growth of a Planetary Health Services Cluster. This aligns with the 10-10 MySTIE Planetary Health Socio-Economic Drivers:
    - Energy
    - Business and Finance
    - Culture, Arts and Tourism
    - Medical and Healthcare
    - Smart Manufacturing
    - Smart Cities and Infrastructure
    - Water and Food Systems
    - Agriculture and Forestry
    - Education
    - Environment and Biodiversity

The End Game

The five systemic shifts are not isolated initiatives. Taken together they form a comprehensive transformation agenda. They are designed to tackle deep-rooted structural and ecological challenges while preparing Malaysia for a sustainable, future-ready path.

The goal is to shift from the current state, marked by fragmentation, ecological stress and siloed decision-making, towards a future defined by ecological stewardship, cross-sector collaboration and inclusive prosperity. Table 2.1 compares the current situation with the future state:

Theme	Current State	Future State (Strategic Direction)
Institutional Vibrancy and Governance	• Leadership and institutions are uneven in awareness and capacity to influence ROV outcomes. • Weak linkages across sectors and inconsistent governance practices hinder progress.	• Prioritise informed leadership that values long-term ROV. • Invest in transparent, accountable and collaborative governance. • Leverage STIE enablers for planetary health outcomes.
Corporate Sector Perspective	• Many firms are aware of sustainability but perceive it as costly or irrelevant. • Limited uptake of sustainable practices.	• Promote a mindset shift from short-term ROI to long-term ROV. • Support industry associations to build awareness and share best practices. • Incentivise private sector transition to sustainable models.
Capability and Incentives	• Fragmented efforts to build sustainability competencies. • SMEs face high barriers and limited support.	• Strengthen incentives through government-industry collaboration. • Close talent gaps via university-industry partnerships. • Help businesses see ROV as a route to competitiveness.
Sectoral Differences	• High-impact sectors like IT and finance struggle with governance and innovation. • Manufacturing is more responsive to new practices but needs support for nature-based models. • Poor cross-sector coordination limits scaling.	• Build cross-sector capabilities for sustainability. • Prioritise energy and high-impact sectors for targeted support. • Boost Research and Development (R&D) investment in nature-based and planetary health solutions.
Theme	Current State	Future State (Strategic Direction)
SMEs vs Large Firms	• SMEs lag in innovation and global competitiveness. • Poor ecosystem support leaves them ill-equipped for the green transition.	• Provide targeted small and medium enterprise (SME) support (training, incentives). • Expand large firms-SME mentoring ("Big-Brother" initiatives). • Strengthen the industrial value chain through inclusive policies.
Regional Disparities	• Regions like Terengganu, Kedah, Perlis and the Borneo states face weak enabling environments. • Limited capacity to extract ROV from local resources.	• Tailor strategies to regional needs and maturity levels. • Channel R&D and investment to green clusters in underserved regions. • Generate high-income, sustainable jobs leveraging local *khazanah*.
Behaviour and Communication	• Public and corporate awareness often fails to translate into meaningful action. • Poor incentives and weak communication strategies. • Few behavioural nudges.	• Launch values-based campaigns and stakeholder engagement. • Support firms in communicating sustainability across supply chains. • Align messaging across government, business and community actors to drive systemic change.

The last step in the process was to translate these insights into actionable strategies with clear responsibilities, defined accountability, expected ROV and timeframes. Each of the five Systemic Shifts has been operationalised through a set of actions linked to the six KRAs. Collectively, these form the foundation of the National Planetary Health Action Plan.

Figure 2-9 outlines the journey Malaysia must follow to realise the vision of the National Planetary Health Action Plan (NPHAP). Each milestone along this roadmap represents a key step towards systemic change, supporting the strategic actions needed for success.

To succeed, the NPHAP must:

1. Establish Malaysia's planetary health boundaries and develop tools to monitor and communicate their status regularly.
2. Align all strategies with STIE enablers to enhance governance, support innovation and improve enforcement.
3. Institutionalise a "Whole-of-Nation" governance model to manage the nation's natural khazanah responsibly and effectively.
4. Foster nature-based industries and green jobs that support both human and planetary well-being.
5. Embed planetary health thinking into everyday life, through education, policies and engagement across Malaysian society, to create positive ripple effects across social and economic systems.

A summary of the steps in development of the NPHAP is presented in Figure 2-9.

Figure 2-9: Milestones and Stakeholder Engagements in Developing Malaysia's NPHAP.

2.4 STI-Enabled Planetary Health as Catalyst for Accelerating SDGs in Malaysia

In alignment with the United Nations' vision, Science, Technology and Innovation (STI) is recognised as a key driver for achieving the SDGs. When integrated into planetary health initiatives, STIE offers five powerful ways to address the complex links between human health and the Earth's natural systems, helping to speed up Malayia's progress on SDG implementation.

1

Data and Monitoring for Evidence-Based Decision-Making

- Leverage advanced technologies to systematise data collection, strengthen monitoring systems and harness the potential of AI for planetary health. With the right level of investment and appropriate governance, these tools can enable more timely, informed and strategic decision-making for planetary health and sustainable development.

2

Technological Innovations for Sustainable Solutions

- Mandate and incentivise nature-based and green technologies that advance environmental sustainability while improving human health and well-being.

3

Interdisciplinary Research for Holistic Solutions

- Institutionalise collaboration among scientists, policymakers, communities and other stakeholders to co-create locally grounded, interdisciplinary solutions. Embed collaboration metrics into performance indicators across all involved sectors.

4

Policy and Governance for Sustainable Development

- Ensure STI insights are systematically integrated into evidence-based policymaking, supporting national frameworks such as NEHAP, DAN 2.0 and NETR. This strengthens governance by making it more inclusive (reflecting diverse perspectives), transparent (informed by data and evidence) and adaptable (responsive to real-time feedback and evolving conditions).

5

Local and Global Collaboration to Address Challenges

- Forge local and global partnerships to facilitate knowledge exchange, technology transfer and capacity-building, particularly within vulnerable communities, to address planetary health challenges collaboratively.

ProSocial AI as a Crosscutting Enabler of Planetary Health in Malaysia (Walther C. 2024)

ProSocial AI is an emerging framework that positions Artificial Intelligence as a deliberate enabler of societal and ecological wellbeing rather than simply a commercial tool. The concept is being advanced within planetary health, sustainability science and AI ethics circles to counterbalance the current paradigmatic risks of "value-neutral" AI. Instead of treating AI as a purely technical instrument, ProSocial AI insists that systems are designed with regenerative intent and be aligned with collective values from the outset. This framing provides Malaysia with a way to ensure that digital transformation strengthens, rather than undermines, the planetary health agenda.

Alongside broader STI enablers, Malaysia can harness ProSocial AI as a transformative force for planetary health. ProSocial AI ensures that Artificial Intelligence is Tailored, Trained, Tested, and Targeted to benefit both people and planet. By embedding values from design to deployment, it can help to power Malaysia's Whole-of-Nation shift toward planetary health.

Central to this approach is **Double Literacy**: the combination of *Human Literacy* (a holistic understanding of aspirations, emotions, and societal-environmental relationships) with *Algorithmic Literacy* (knowledge of how AI functions and why it matters). This dual lens safeguards agency in an AI-saturated world, equipping citizens to make informed choices and resist intellectual displacement by opaque machine-driven systems.

Hybrid Intelligence, the combination of human creativity, ethics and lived experience with AI's speed, scale and predictive capacity, can help to strengthen achievement of the planetary health agenda laid out in this plan. Together, they can ensure that innovation enhances rather than depletes Malaysia's ability to transition successfully.

ProSocial AI also reframes accountability. By distinguishing between "Garbage In, Garbage Out" (GIGO) and "Values In, Values Out" (VIVO), it underscores the need for *human stewardship*. With the right safeguards, AI transforms from a neutral tool into a societal enabler that advances Return on Values.

KRA	How ProSocial AI can serve as enabler
Governance	Enables development and operation of transparent, data-driven platforms for decision-making, accountability, and real-time impact tracking across ministries and agencies.
Environment and Health	Supports human-led integration of ecosystem and health monitoring (air, water, biodiversity) with predictive analytics to strengthen preventive care and resilience.
Sustainable Food	Enables more rapid and accessible precision agriculture, provides direction on reducing chemical dependence, and links supply chains to sustainability indicators for nutrition and equity.
Research and Education	Enables expansion of innovation capacity by embedding double literacy into curricula and connecting local research with global networks.
Energy Transition	Supports optimisation of renewable energy deployment, grid stability, and equitable access to clean technologies through predictive modelling.
Values, Culture Shift of society, Behavioural change and Communication	Supports ethical behavioural insights and inclusive communication strategies while embedding stewardship and intergenerational justice into narratives.

MALAYSIA'S GAME-CHANGING BETS: KEY RESULT AREAS AND SYSTEMIC SHIFTS TOWARDS PLANETARY HEALTH AND SUSTAINABILITY

Malaysia must move beyond a zero-sum approach to development and embrace a values-driven framework that places planetary health and sustainability at the centre of national progress. This chapter sets out the Key Result Areas (KRAs) that will guide this transition, providing a clear framework for action that aligns national progress with the protection of ecosystems, human wellbeing and long-term resilience.

Governance

Strong governance is essential for making planetary health work. It helps build resilience and ensures that systems can respond to challenges effectively through:

- Empowering local governance and strengthening community-level systems, so that responses to environmental and health risks are timely, place-specific and people-centred.
- Improving enforcement and coordination across sectors to reduce long-term risks in innovative and sustainable ways.
- Making public institutions more effective, accountable and responsive—especially to the needs of the poorest and most vulnerable.

When planning governance strategies, it is critical to understand that planetary health issues are both transboundary and crosscutting, spanning jurisdictions and affecting multiple sectors. This means everyone has a role to play, from national, state and local governments to the private sector, civil society and individuals.

To make this work in practice, Malaysia must establish a **Common Governance Framework** and align efforts across stakeholders, ensuring effective implementation and tangible outcomes at all levels.

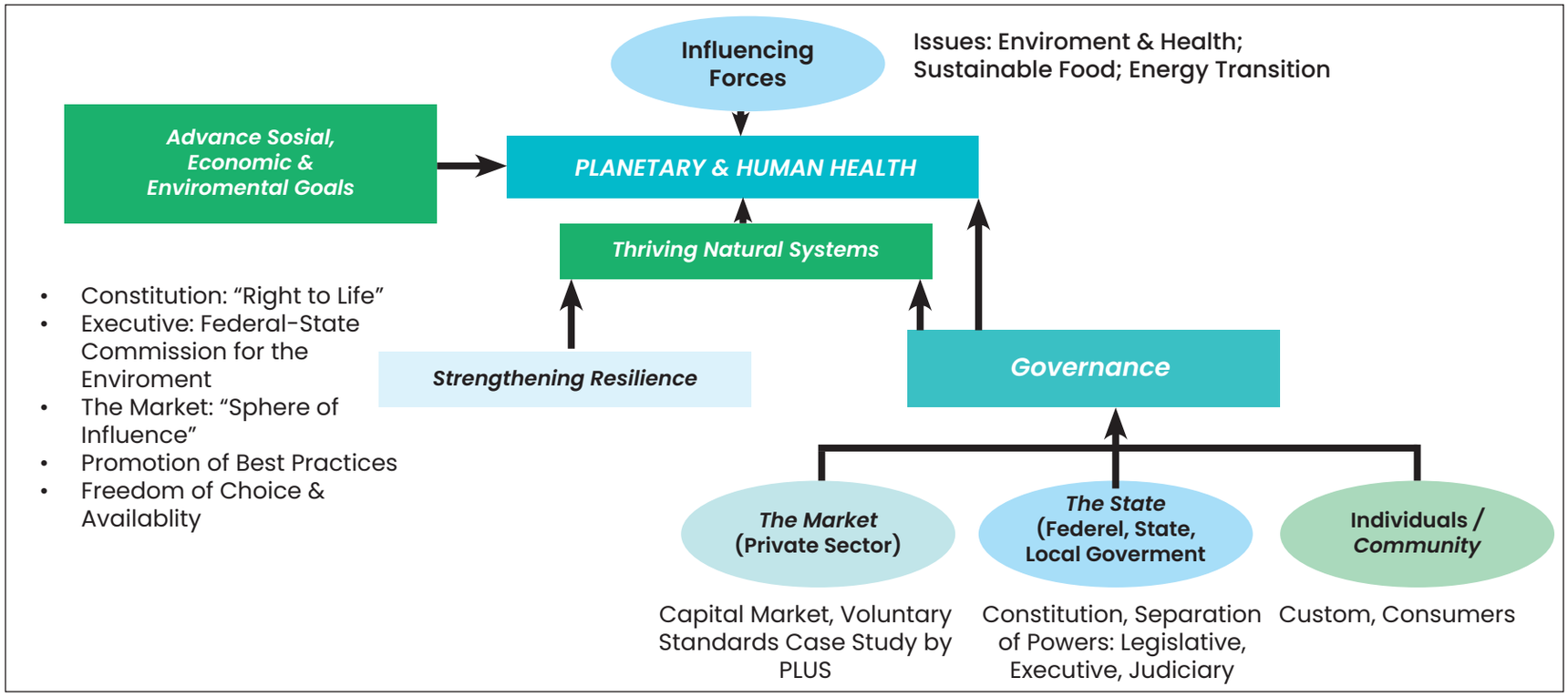


Figure 3-1: Governance Quality and its Impact on Planetary and Human Health Outcomes

Source: Horton, R (2013)

Proposed Governance Structure Options

To deliver on the NPHAP through a true, Whole-of-Nation approach, the plan proposes the expansion of the National SDG Council, which is chaired by the Prime Minister. This aligns with the United Nations' call to use science, technology and innovation (STI) as key tools to accelerate progress toward the Sustainable Development Goals (SDGs). Expanding the Council's mandate to include planetary health and STI solutions will help Malaysia take a more integrated and science-based approach to sustainability, well-being and economic resilience. This integrated governance model will strengthen high-level political commitment across sectors and open opportunities for collaboration and more coherent policymaking.

Outlined below are three options to strengthen national leadership and coordination, making planetary health a core part of Malaysia's sustainable development journey. These are not just bureaucratic adjustments; they are bold, forward-looking proposals to embed planetary health into national priorities and everyday decision-making.

Option 1: Embed a Panel of Experts within the Existing SDG Council Structure

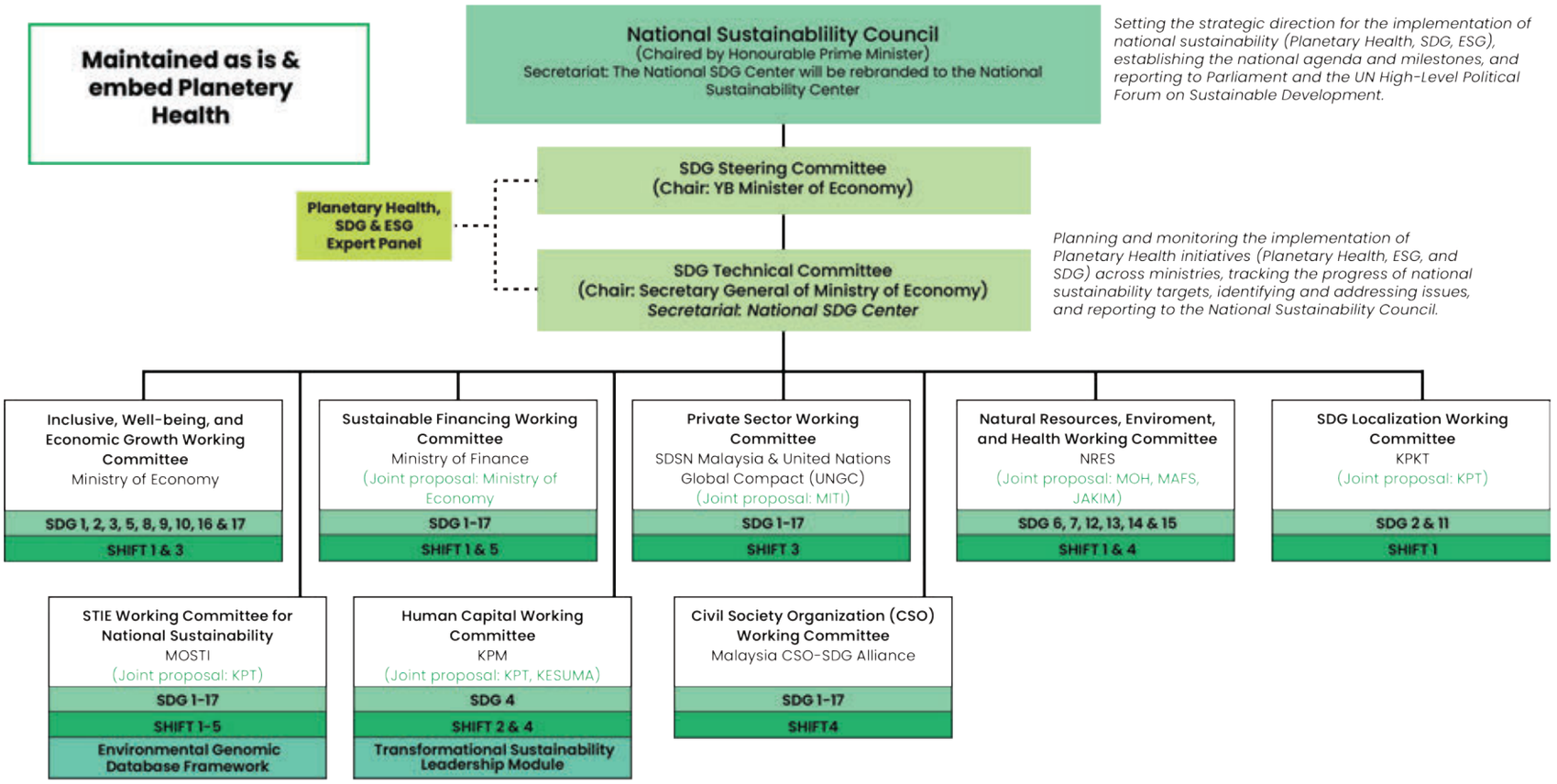


Figure 3-2: Governance Option 1

This option follows a pragmatic route, focusing on optimising the current system without introducing new layers of governance:

- Retain the Existing National SDG Council without Structural Changes: The National SDG Council would remain unchanged, with no new committees or expanded mandate.
  - » Leadership under the Prime Minister and the current governance framework would be preserved as is.
- Embed a Panel of Experts on Planetary Health, SDGs and ESG: A technical advisory panel would be integrated directly into the existing Jawatankuasa (committees) that support the Council.
- This panel would provide specialised, evidence-based insights to guide:
  - » Policy formulation
  - » Programme implementation
  - » Cross-sectoral coordination
  - » Monitoring and evaluation of sustainability and planetary health initiatives
- Maximise Existing Institutional Strengths: Rather than building new structures, this approach leverages current capacities by embedding critical technical expertise into the operational core of existing governance bodies.
- Address Technical Gaps Through Embedded Expertise: This model enhances scientific credibility and policy responsiveness without requiring new institutional mandates or bureaucracy—making it low-cost, minimally disruptive and readily implementable.

Option 2: Strengthen the Existing SDG Governance Structure with a New STIE Working Group

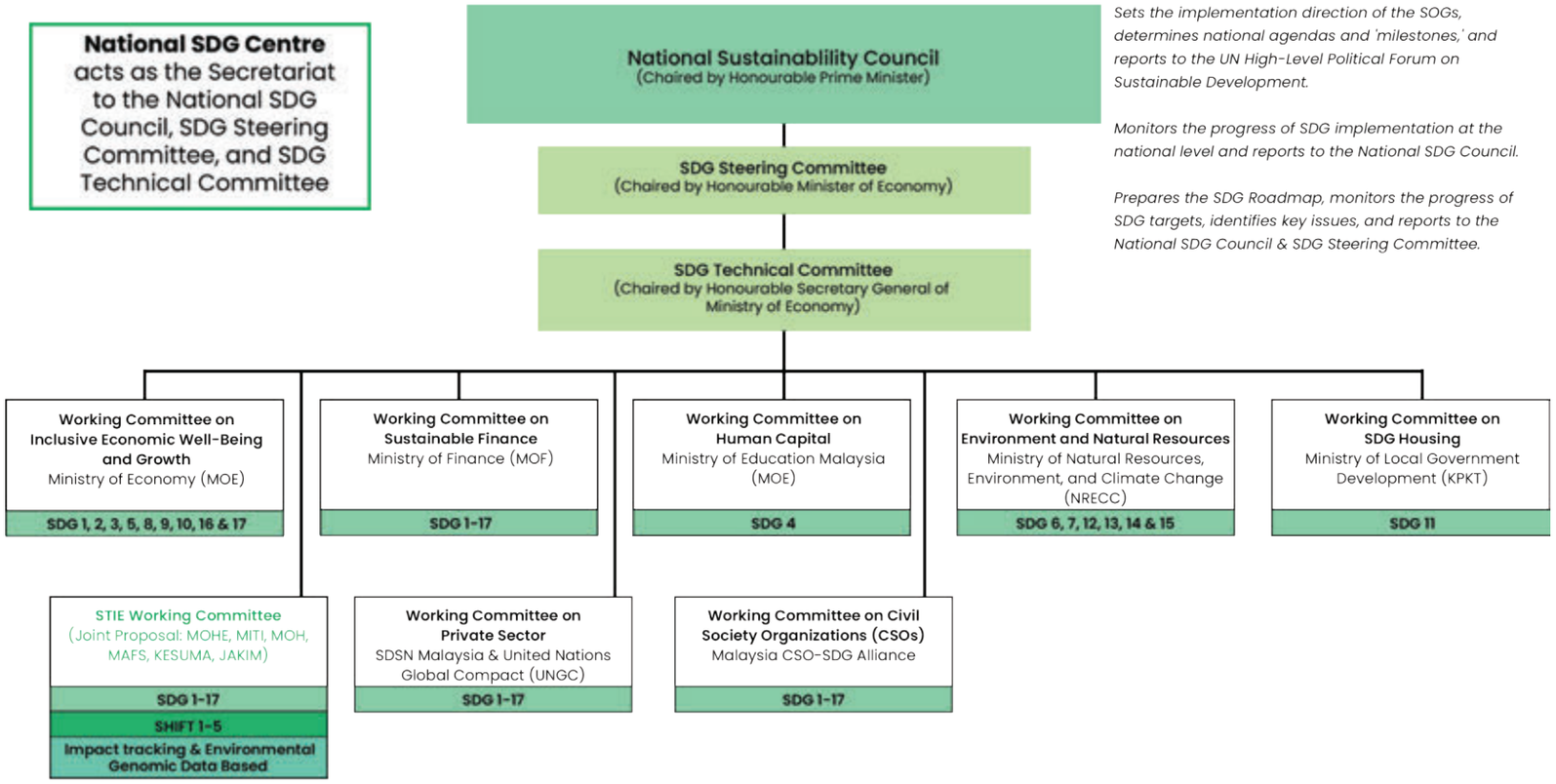


Figure 3-3: Governance Option 2

This option retains the current institutional architecture while addressing key gaps in innovation and implementation:

- **Maintain the Existing National SDG Council Structure:** The current National SDG Council, chaired by the Prime Minister and its associated governance arrangements would be preserved to ensure continuity and sustained political commitment.
- **Introduce a Science, Technology, Innovation and Economy (STIE) Working Group:** A new STIE Working Group would be established as the strategic and technical arm of the Council, with the following roles:
  - » Identify and support innovative, science-based solutions.
  - » Monitor progress in applying these solutions to advance SDG and planetary health goals.
  - » Provide evidence-based inputs into national planning and development processes.
- **Ensure Multi-Sectoral Collaboration:** The STIE Working Group would be formed through active collaboration between key ministries, including:
  - » Ministry of Higher Education (KPT)
  - » Ministry of International Trade and Industry (MITI)
  - » Ministry of Health (KKM)
  - » Ministry of Agriculture and Food Security (MAFS)
  - » Ministry of Human Resources (KESUMA)
  - » Department of Islamic Development Malaysia (JAKIM)

  This ensures a multi-sectoral and interdisciplinary approach to innovation, implementation and monitoring.
- **Address Gaps in Current Arrangements:** This proposal directly responds to existing weaknesses by embedding science, technology and innovation into national planning, policy integration and development strategies, without requiring major structural reform.

Option 3: Establish a National Sustainability Council and Strengthen Governance for Planetary Health, SDGs and ESG, with mandate that extends beyond 2030 to sustain the national sustainability agenda post-SDGs.

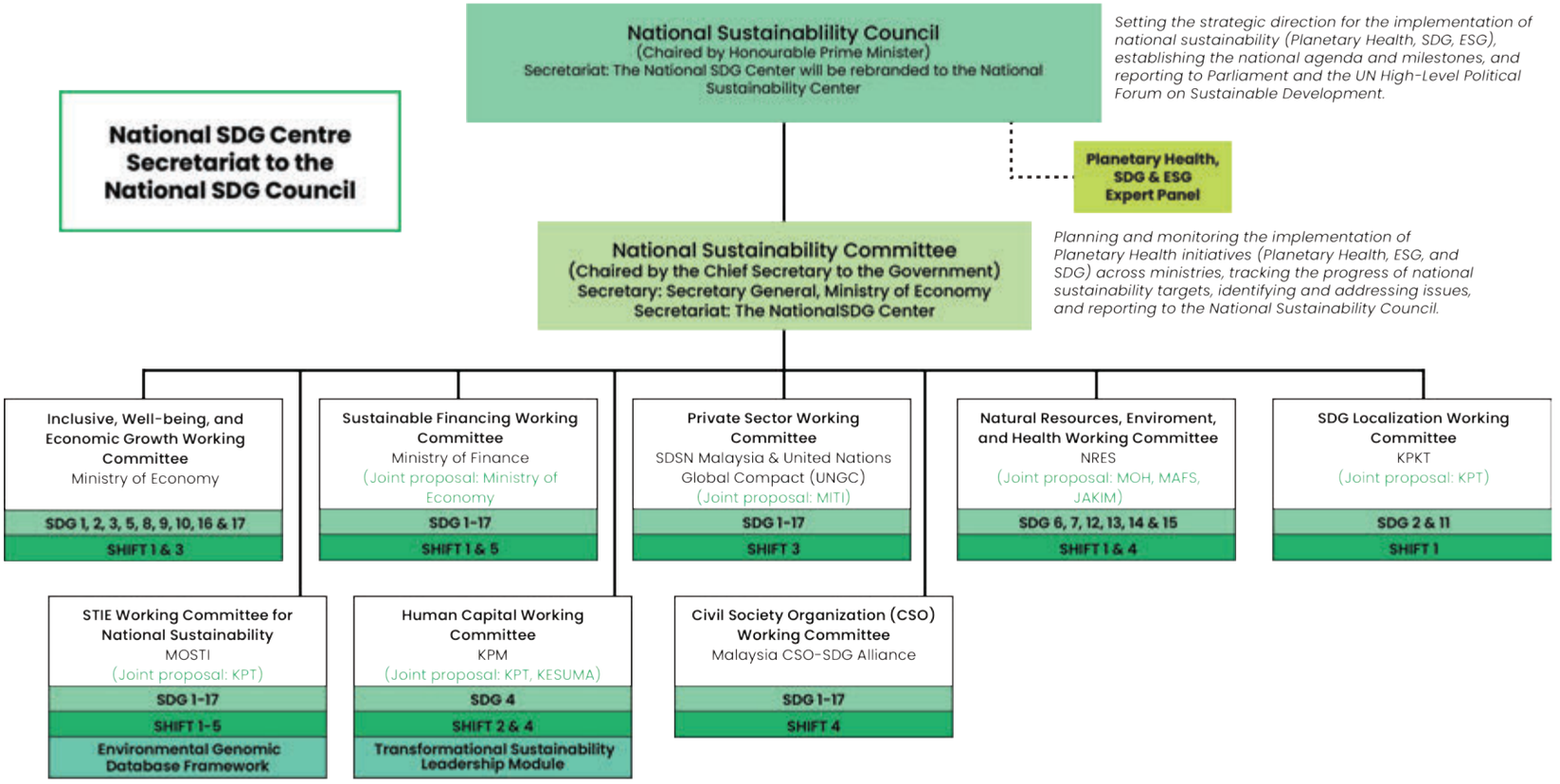


Figure 3-4: Governance Option 3

This option proposes a significant overhaul of the current sustainability governance architecture:

- **Establish a National Sustainability Council**: A high-level governance body to integrate Environmental, Social and Governance (ESG) principles and planetary health, providing strategic direction and oversight on Malaysia's sustainability agenda extending beyond 2030.
- **Create a Panel of Experts on Planetary Health, SDGs and ESG:** This Panel would function as a technical advisory body to the Council, offering guidance grounded in science, policy and practice.
- **Restructure Existing Institutions:**
  - » The existing SDG Committee would be restructured into a National Sustainability Committee aligned with the Council's expanded scope.
  - » The current SDG Centre would be elevated to become the National Sustainability Centre. This new Centre would support both the Council and the Committee, offering integrated strategic and technical direction across planetary health, SDGs and ESG domains.
- **Enhance Cross-Sectoral Coordination:** Key ministries would be formally included in this structure to ensure coherence, alignment and Whole-of-Government coordination.
- **Establish a Science, Technology, Innovation and Economy (STIE) Working Committee:** A dedicated STIE Working Committee would be set up to drive innovation and track its application in sustainability solutions.
  - » This responds to a major gap in current governance arrangements.
  - » The Committee would recognise and harness the essential role of STIE in addressing complex and interlinked sustainability challenges.

Governance Stakeholders

The Governance Pillar drives action across the NPHAP framework by enabling coordination, accountability and leadership. It operationalises the 8R-8I STIE ecosystem and is grounded in values such as political will, strategic partnerships, inclusive participation, competency and data-driven decision making. At its core, it puts the Whole-of-Government, Whole-of-Society approach into practice.

This approach is essential because planetary health challenges cut across sectors, systems and levels of government. They demand coordinated responses from diverse actors across Malaysia's political, social and economic landscape. A shared governance and accountability framework is therefore not optional; it is the foundation for meaningful, system-wide change.

The key stakeholders in the NPH ecosystem include:

- Individuals/Communities: Individuals, community-based groups, religious and Indigenous communities and non-governmental organisations (NGOs).
- Institutions: Universities, research centres and secondary and primary schools.
- Government and Policy Makers: Federal and state government agencies, local councils, regulatory agencies and parliamentarians.
- Private sector: Micro, small and medium enterprises (MSMEs), multinational corporations (both foreign and local) and government-linked companies.

Each plays a vital role in strengthening governance for planetary health and helping to advance Malaysia's sustainable development agenda, as illustrated in Figure 3-5.

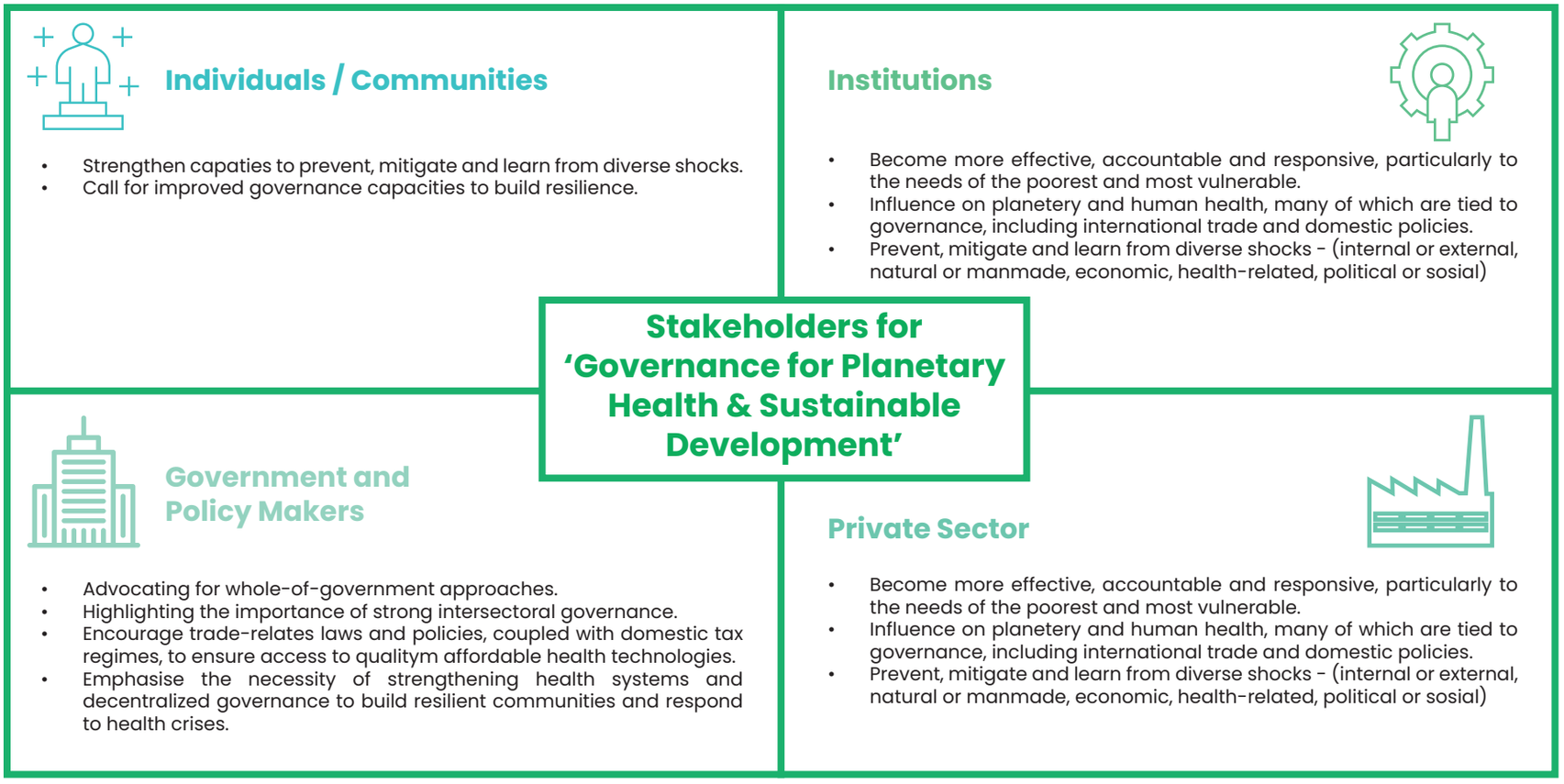


Figure 3-5: Key Stakeholders in NPHAP Governance

Source: ASM 2023

Foundational Principles for Strengthening Planetary Health Governance

Effective planetary health governance requires collective accountability and the active participation of multiple stakeholders. Its legitimacy and impact rest on three internationally recognised principles, all drawn from the 1992 Rio Declaration on Environment and Development (United Nations: 1992):

A

Precautionary Principle: "Prevention is better than cure."

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Rio Declaration, Principle 15

This principle urges early action in the face of uncertainty, recognising that delaying response to environmental threats—even without full scientific proof—may cause irreversible harm.

B

Polluter Pays Principle: "Those responsible for pollution should bear the cost of managing it."

"National authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment."

Rio Declaration, Principle 16

This principle ensures that economic systems do not externalise environmental harm and that those causing pollution are financially accountable for remediation and prevention.

C

Common but Differentiated Responsibilities (CBDR): "All must act—but according to their means."

"States and people shall cooperate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development."

Rio Declaration, Principle 27

CBDR recognises that while all countries share responsibility for environmental stewardship, their obligations differ based on historical contributions, financial capacity and development status. This principle promotes equity, cooperation and mutual support.

Good institutional governance also requires good financing/financial instrument to move Planetary Health.

Landscape Insight: Strategic Financing for Planetary Health Governance

Effective governance for planetary health requires innovative and equitable financing mechanisms. The following instruments can strengthen both environmental outcomes and economic resilience:

1. Polluter Pays Principle (PPP): Internalising the true cost of pollution.

To realign market incentives, pollution must be priced into the cost of goods and services. This principle, endorsed by the OECD and successfully implemented in several developing countries, has proven effective in improving both human and planetary health outcomes.

Key Recommendations:

- Introduce new fiscal instruments including:
  - Penalties and fines for environmental harm
  - Carbon credits and trading mechanisms
  - Environmental taxes (e.g. air, water, plastic)
  - User charges for pollution-intensive activities
- Undertake cost-benefit analyses to determine the impact and feasibility of each proposed measure.
- Frame these instruments as both revenue-generating and catalysts for innovation and cleaner business practices.

2. Catastrophe Bonds (CAT Bonds): Risk financing for climate-related disasters.

CAT bonds are a form of insurance-linked securities that transfer risk from insurers to capital markets, offering high-yield investment opportunities while protecting against large-scale natural disasters.

Key Features:

- Provide financial backing for insurance claims related to major catastrophes such as floods and extreme weather events.
- Attract capital from institutional investors, including hedge funds and pension funds.
- Short maturity cycles and risk-sharing structures make them attractive and agile.
- Strategic Value:
- Offers a reliable buffer for government and private sector risk exposure.
- Enhances national financial resilience to climate shocks without overburdening public finances.

3. Environmental Dividend Mechanism: Incentivising state-level environmental action.

Planetary health improvements boost national GDP and fiscal health. A portion of the federal revenue gains from improved environmental governance could be reinvested in states through an Environmental Dividend.

Proposal:

- Establish a formula-based transfer mechanism from Federal to State Governments.
- Allocate funds proportionally based on each state's environmental performance and improvement, particularly in river basin governance.
- Reserve a portion of funds to support the operational needs of the National Planetary Health Commission.

Next Steps:

- Commission a study to determine a fair revenue-sharing formula.
- Develop indicators to assess state-level planetary health outcomes and track progress.

Challenges and Insights

A review of Malaysia's governance frameworks, including the Constitution, policies, laws and regulations, has identified several key challenges.

Challenge 1: Expanding the Scope and Interpretation of the "Right to Life" principle under Article 5(1) and Article 8(1) of the Malaysian Federal Constitution

The "right to life" is a fundamental liberty enshrined under Article 5(1) of the Malaysian Federal Constitution. This right includes not only the right to live but also access to essential elements of life—clean air, safe water, nutritious food, health, work and dignity. Complementing this, Article 8(1) guarantees that all persons are equal before the law and entitled to equal protection. Taken together, these provisions imply that laws or policies which erode access to life-sustaining resources or create inequality in their distribution may be constitutionally unsound.

However, the current interpretation of this right remains limited in scope. There is a growing need to recognise that environmental wellbeing, social justice and planetary health are directly linked to the right to life, livelihood and dignity. Malaysia's legal system must consider a broader, more progressive interpretation of this right—one that reflects current and future environmental and social realities. This includes using judicial discretion to strengthen or introduce laws that protect and conserve the environment and support Malaysia's response to the climate emergency.

Landscape Insight: Legal Foundations for Planetary Health: Reinforcing the Right to Life

A growing body of Malaysian jurisprudence affirms the legal basis for recognising and protecting a clean, healthy and sustainable environment as part of the fundamental "right to life". This legal trajectory reinforces the case for embedding planetary health considerations into national governance frameworks.

1. Judicial Precedents Supporting Environmental Rights

Tan Tek Seng v. Suruhanjaya Perkhidmatan Pendidikan and Anor (1996)
In this landmark Court of Appeal decision, the Court broadened the interpretation of Article 5(1) of the Federal Constitution, stating that the right to life includes "the right to live in a reasonably healthy and pollution-free environment." This marked a foundational shift towards environmental constitutionalism in Malaysia.

Sivarasa Rasiah v. Badan Peguam Malaysia and Anor [2010] 2 MLJ 333
The Federal Court upheld the broader interpretation of constitutional rights, reinforcing the inclusive reading of the right to life to encompass both quality of life and the integrity of the environment. These decisions underscore a progressive judicial approach, aligning Malaysia with international legal trends that integrate environmental protection within the framework of human rights.

2. Endorsement by the Judiciary
This principle has been consistently acknowledged in the public addresses of Malaysia's top judges, reflecting a maturing legal consciousness on environmental rights:

- *Tun Arifin Zakaria, Opening of the Legal Year 2017*
- *Tan Sri Richard Malanjum, ENSEARCH K. Kumarasivam Memorial Lecture, 2018*
- *Tun Tengku Maimun binti Tuan Mat, Judicial Capacity Building Workshop, 2 December 2020*

These affirmations reflect a strong institutional recognition that environmental protection is integral to justice, effective governance and the rule of law.

Challenge 2: Reforming Vertical Governance into a More Joined-Up, Inclusive System

Malaysia's federal system divides powers and responsibilities between the federal and state governments. States have jurisdiction over environmental matters such as land, rivers and other natural ecosystems, within their territories. However, this division of powers leads to siloed responsibilities and uncoordinated decision-making, enforcement and outcomes.

To avoid these risks, Malaysia needs stronger enforcement and more effective policy delivery. More importantly, it should consider establishing a more integrated system of environmental governance. One option is to create a central coordinating body with a mandate to monitor, coordinate and audit the performance of environment-related agencies across federal, state and local levels. This would improve the management of planetary health, reduce jurisdictional disputes and turf wars, prevent enforcement failures and ensure that efforts at all levels are aligned towards shared goals.

Ecosystem Insight: Aligning Malaysia's Environmental Mandate with Planetary Health

Malaysia has made substantial progress in developing policies, legal frameworks and institutions to protect people, ecosystems and the planet. However, systemic challenges remain in coordinating federal and state mandates, as well as aligning cross-sectoral governance for impact at scale.

1. **Existing Frameworks and Institutional Strengths:** Malaysia has established a wide range of environmental and sustainability policies, supported by a strong legal and institutional infrastructure (see Appendix 3.1). These include:

Environmental Quality Act (EQA) 1974, Malaysia's primary legislation safeguarding the environment, supported by complementary laws including:

- National Forestry Act (1984)
- Fisheries Act (1985)
- Exclusive Economic Zone Act (1984)
- Merchant Shipping Ordinance (1952)
- National Land Code (1965)
- Land Conservation Act (1960)
- Local government by-laws

Key policies underpinning planetary health efforts include:

- Environmental Policy (2002)
- National Green Technology Policy (2009)
- National Climate Change Policy (2009)
- Strategic initiatives such as MDG Malaysia and SDG Malaysia

Malaysia actively participates in global environmental agreements, ESG frameworks and regional climate fora, demonstrating international alignment and political commitment.

2. **Governance Fragmentation—The Federal-State Divide:** Despite this robust framework, fragmented governance hinders impact. For example, land and water resources are state responsibilities, but public health and sanitation, which depend heavily on land and water quality, fall under federal jurisdiction. This misalignment of constitutional powers creates inefficiencies, conflicting mandates and diluted accountability.

3. **The Planetary Health Opportunity:** The Planetary Health Action Plan aims to create a breakthrough governance mechanism that bridges these divides. It seeks to:

- Align federal and state mandates without undermining jurisdictional autonomy
- Unify implementation across ministries and departments
- Deliver consistent, measurable impacts aligned with both national interests and public good

4. **Case Study: UK Environmental Principles Policy Statement (EPPS):** The United Kingdom offers a useful precedent for mainstreaming environmental principles in governance. In January 2023, the Environmental Principles Policy Statement (EPPS) was tabled in Parliament. From 1 November 2023, all government ministers are legally obligated to consider the environmental impacts of their policies. EPPS operationalises five key principles—including the precautionary and polluter pays principles—as required by the Environment Act 2021.

Impact Potential: If embedded meaningfully across government, the EPPS is considered a "game changer" that can prevent environmental degradation and accelerate improvements.

Recommendation for Malaysia: A similar initiative under an updated Environmental Quality Act should be introduced to institutionalise core environmental principles in all policy and planning processes.

Conclusion: Malaysia has the policy foundations and global experience to lead on planetary health. The next step is to move from commitment to coordination, with integrated governance mechanisms that align federal and state powers, embed legal environmental principles and drive transformative, system-wide change.

Challenge 3: Mobilising Corporate and Non-Corporate Resources for Strategic Investment in Planetary Health

Corporate Social Responsibility and ESG Funds are growing in Malaysia with an estimated value of RM 134 billion (Asia Asset Management, 2023; Business Today Malaysia, 2024; CIMB Group, 2023), mostly contributed by the corporate sector. Unlike some countries (e.g. India) Malaysia does not currently mandate listed companies to allocate funds for sustainability (ClearTax, 2024). Nonetheless, recent trends indicate growing corporate commitment:

- The Employees Provident Fund (EPF), the nation's largest pension fund, has launched a sustainable investment policy and aims to have a fully ESG-compliant portfolio by 2030. It now requires its investee companies to show environmental leadership to support this ambition.
- The government's climate commitments have spurred new businesses and investments in renewable energy projects such as solar and wind power.
- Business communities and civil society are actively supporting social causes, including reducing poverty and inequality, through targeted engagement and impact-driven initiatives.

International donors, NGOs and civil society organisations also channel significant funding into socio-economic, environmental and community initiatives. However, these efforts are often fragmented, with strategies that may be disconnected, overlapping, or even conflicting. This lack of coordination reduces their overall impact, particularly in areas that are critical for planetary health.
While the private sector plays a pivotal role in Malaysia's planetary health transformation, survey findings from over 700 firms reveal substantial gaps in both readiness and capability. Although there is growing awareness of environmental issues, particularly among large enterprises and government-linked companies (GLCs), this does not consistently translate into concrete action. SMEs, in particular, report limited knowledge of planetary health principles and cite multiple barriers to engagement, including:

- High perceived costs of transformation.
- Unclear business incentives and support mechanisms.
- A lack of sector-specific guidance and technical know-how.
- Weak alignment between environmental regulations and business realities.

This points to an urgent need for governance reforms that improve regulatory clarity, strengthen enforcement and create supportive frameworks to encourage planet-friendly behaviour across all firm sizes. To break inertia and unlock the private sector's potential to deliver ROV for both the economy and the environment, Malaysia must scale up public–private partnerships, offer financial incentives and invest in targeted capacity-building programmes.

Firm-level analysis of Malaysian business leaders underscores that institutional vibrancy, or the dynamism and effectiveness of institutions, is key to enabling private investment in planet-friendly solutions. This vibrancy depends on strong leadership across all actors in the ecosystem, robust partnerships and a well-governed planetary health system. Further insights from the corporate planetary health ecosystem analysis are provided in Appendix 1.

A national survey of 1,000 people from diverse backgrounds shows that federal and state government agencies are seen as the primary drivers of planetary health initiatives. However, industry is also recognised as playing a key role in promoting sustainable practices. Details of public-level survey results are shown in Appendix 2.

Both the firm-level and public-level surveys highlight that solid planetary health governance is key. There must be clear direction, strong partnerships and supportive laws, policies and incentives to help players in the ecosystem work together in a coordinated and impactful way. The NPHAP offers an opportunity for all stakeholders—corporate, governmental and civil society—to align resources, ensure that efforts are focused, collaborative and result in impactful and sustained outcomes for people and the planet.

Case Study: The Significance of Stakeholder Alignment – the Case of Royal Belum State Park

1. **Overview and Legal Status:** The Royal Belum State Park, located within the Belum-Temengor Forest Complex in northern Perak, is one of Malaysia's most important conservation landscapes. Initially gazetted as the Belum Forest Reserve in 1971, it was re-designated as a State Park in 2007 under the Perak State Park Corporation Enactment 2001 (Section 6). This elevated status underscores its ecological and national importance, earning it the title "The Crowning Glory of the Peninsula."

Covering 117,500 hectares, the park forms a critical component of the Central Forest Spine (CFS), Peninsular Malaysia's primary ecological corridor. Reaching 1,533 metres above sea-level, it encompasses diverse forest types including lowland dipterocarp, hill dipterocarp and lower montane ecosystems.

2. **Ecological Significance:** Estimated at over 130 million years old, Royal Belum is one of the oldest rainforests on Earth, predating both the Amazon and the Congo rainforests. It is a living repository of biodiversity, hosting:

- Endangered flagship species such as the Malayan Tiger, Asian Elephant, Malayan Tapir and Sun Bear
- All 10 species of hornbills found in Malaysia
- The Rafflesia, the world's largest flowering plant
- Countless endemic and scientifically significant plant and animal species

This richness makes Royal Belum a prime candidate for UNESCO World Heritage Site designation.

3. **Conservation Leadership and Partnerships:** The park is a testament to the Perak State Government's commitment to conservation, supported by a network of stakeholders including:

- The Orang Asli indigenous communities
- WWF-Malaysia and other international environmental organisations
- The Perak State Parks Corporation, which oversees park management and policy

Efforts focus on habitat preservation, anti-poaching enforcement, biodiversity monitoring and the development of community-based ecotourism.

4. **Strategic Importance for Planetary Health:** Royal Belum embodies the integrated principles of ecological integrity, cultural stewardship and sustainable development. Its protection contributes directly to:

- Climate regulation and carbon sequestration
- Water security for surrounding regions
- Biodiversity conservation at a global scale
- Livelihood opportunities for indigenous communities through sustainable tourism

Its continued protection provides a national and global model of effective planetary health governance in action.
(UNESCO, 2017)

The Systemic Shifts for Governance

The study finds that the current system is fragmented and ineffective in balancing economic development with planetary health and sustainability. It proposes a refinement of the existing governance structure to foster collaboration and cooperation among all stakeholders, ensuring a more cohesive and transparent framework. This improved governance model would enable effective monitoring, tracking and management of the nation's natural ecosystems. The refinement includes clear strategies, concrete actions, impact-tracking mechanisms and designated lead agencies to deliver outcomes in the short, medium and long term.

Current State	Future State
Governance is fragmented, resulting in uncoordinated development efforts that fail to deliver meaningful ROV for all stakeholders.	A well-functioning, efficient governance system fosters collaboration and cooperation across all players in the ecosystem.
Fragmentation has encouraged rent-seeking, moral hazard and tensions between key actors, undermining trust across sectors.	Strong governance restores trust and motivates stakeholders to co-create cross-sectoral value chains across regions. This cohesive approach enables better management of both financial and natural assets, supporting a sustainable socioeconomic future aligned with planetary health principles.
Poor coordination has contributed to Malaysia breaching several planetary health boundaries, exposing the population to serious health risks.	A reformed governance system reverses environmental decline, restores ecological stability, improves quality of life and boosts the global competitiveness of Malaysia's economy

Table 3-6: Governance Transition

Five Systemic Shifts for Governance

Towards a healthier and more sustainable future, five systemic shifts are recommended to address the challenges documented above.

	1	2	3	4	5
	Strengthening the Governance and Management of the Nation's Natural Khazanah	**Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation**	**Planet-Friendly Businesses**	**Effective Communication, Behavioural and Values Mindset**	**Sustainable Financing and Resourcing Planetary Health Development**
FOCUS	Expand the role of National SDG Council to ensure a holistic, Whole-of-Nation approach to planetary health across Malaysia.	Institutionalise behavioural economics for planetary health.	Forge strong public-private-community partnerships to create a robust and dynamic governance system.	Leverage government agencies, government-linked companies, and public research institutions to drive planetary health-related behavior within business supply chains.	Initiate public-private-community partnerships to drive planetary health-related initiatives.
CORE ELEMENTS	Undertake legal and constitutional reforms to mainstream planetary health. Strengthen enforcement and incentive mechanisms to ensure compliance with planetary health practices. Effective communication and stakeholder to build trust and accountability in planetary health initiatives.	Empower vulnerable communities to ensure inclusive participation in planetary health initiatives. Enhance education and training to promote planetary health-based education and activities. Strengthen institutional collaboration to create a seamless integrated RDICE ecosystem.	Adhere to Planetary Health best practice and green procurement. Integrate certification schemes for micro, small, and medium enterprises (MSMEs) across the supply chain to promote inclusivity in planetary health. Develop a unified framework for PH, ESG and SDGs.	Focus on strategic communication and technology integration to showcase the return on value of adopting planetary health-friendly behaviour. Intensify planetary health-related communication campaigns through ecosystem support and advocacy to raise awareness and drive action.	Establish a dynamic financing mechanism through strategic financing, resource optimisation, and cross-sector collaboration. Design and implement incentive-driven approaches to accelerate planetary health and sustainability.

Figure 3-7: Five Systemic Shifts for Governance

Action Plans, Lead Agencies and Impact Tracking

Shift 1: Strengthening the Governance and Management of the Nation's Natural Khazanah

This shift focuses on a time-bound, multi-agency strategy to expand the mandate of the National SDG Council, embed planetary health in constitutional and legal frameworks and strengthen integrated environmental governance through expert advisory structures, legal reforms and enhanced enforcement mechanisms.

GOVERNANCE PILLAR: SYSTEMIC SHIFT 1

Strategies	
Expand the scope of the National SDG Council to coordinate enforcement, mainstream planetary health practices and promote integrated environmental governance across all levels and sectors of government.	
Short Term (2027)	
1. Establish a Planetary Health Advisory Group comprising legal, constitutional, scientific and industry experts to: • Advise the National SDG Council and Steering Committee on necessary constitutional amendments to embed planetary health. • Guide regulatory bodies and policy designers on governance and integrity systems that promote PLANETARY HEALTH-aligned behaviour. 2. Develop a strategic communications plan to engage state governments, policymakers, industries, community leaders and the public on the value of planetary health—including its contributions to employment, industrial development, competitiveness and national prosperity.	
Mid-Term(2030)	
1. Propose an amendment to Article 5(3) of the Federal Constitution to expand the "right to life" to include the "right to ensure the health of the planet." 2. Strengthen enforcement mechanisms and introduce fiscal incentives to drive adoption of planetary health practices. 3. Formulate new laws to enable the Commission and River Basin Authorities to manage natural ecosystems more effectively and deliver greater ROV for stakeholders. 4. Conduct a legal review to support the formation of the Commission, anchored in the proposed constitutional amendment to Article 5(1).	
Long-Term (2050)	
Harmonise laws, enactments, ordinances and policies with the Planetary Health Charter and international best practices, ensuring that human rights are upheld during the management of Malaysia's natural Khazanah.	
Lead Agencies	**Impact tracking**
PMO (Legal and Institutional Reforms), State government	• Continuous survey on planetary health to the national security of the country. • Number of laws, enactments, ordinances and policies that are aligned to planetary health best practices. • Data access and transparency. • Monitoring and impact tracking in Sabah and Sarawak and Peninsular Malaysia.

Shift 2: Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation

This shift focuses on institutionalising behavioural change and planetary health thinking across government and society, with actions focused on inclusive education, targeted community support, behavioural science integration and strengthening public institutions to drive long-term, STIE-enabled transformation.

<table>
<tr><td rowspan="10">GOVERNANCE PILLAR: SYSTEMIC SHIFT 2</td><td colspan="2">Strategies</td></tr>
<tr><td colspan="2">Institutionalise behavioural economics and change management within government to address cognitive biases and support planetary health-related policies.</td></tr>
<tr><td colspan="2">2027 Short Term</td></tr>
<tr><td colspan="2">1. Identify and support vulnerable communities, especially women, low-income groups and Indigenous populations, to improve quality of life and environmental resilience.
2. Enhance education and training curricula by integrating behavioural science and planetary health principles.
3. Map and mobilise existing trainers in planetary health-relevant areas.</td></tr>
<tr><td colspan="2">2030 Mid-Term</td></tr>
<tr><td colspan="2">Develop accessible online content for educators, policymakers and influencers to promote planetary health-focused education and public engagement, using behavioural tools such as nudge theory.</td></tr>
<tr><td colspan="2">2050 Long-Term</td></tr>
<tr><td colspan="2">1. Mandate public institutions of higher learning (IHLs) to support STIE-driven supply chains and promote planetary health-aligned development.
2. Strengthen the role of Public Research Institutions (PRIs) in supporting an integrated RDICE ecosystem by:
• Building trusted partnerships with IHLs and industries.
• Expanding the supply of highly specialised and skilled workforce to meet national economic needs.</td></tr>
<tr><td>Lead Agencies</td><td>Impact tracking</td></tr>
<tr><td>PMO (Legal and Institutional Reforms), MOE, MOH, State Governments, KBS, KPWKM, Religious Institutions, MPC, NGOs</td><td>• Continuous assessment (survey) of policymakers, industry and rakyat's perspectives on the importance of planetary health to the national security of the country.
• Number of laws, enactments, ordinances and policies that are aligned to planetary health best practices.
• Education process effectiveness.</td></tr>
</table>

Shift 3: Planet-Friendly Businesses

This shift focuses on building an integrated, STIE-enabled governance ecosystem by strengthening public-private-community partnerships, enforcing planetary health standards in procurement and certification and developing unified tools and metrics to align business practices with sustainability and national development goals.

<table>
<tr><td rowspan="8">GOVERNANCE PILLAR: SYSTEMIC SHIFT 3</td><td colspan="2">Strategies</td></tr>
<tr><td colspan="2">Establish strong public-private-community partnerships to develop a dynamic governance system underpinned by advanced STIE infrastructure and talent.</td></tr>
<tr><td colspan="2">Short Term (2027)</td></tr>
<tr><td colspan="2">Ensure all government operations comply with planetary health standards, including full implementation of green procurement policies.</td></tr>
<tr><td colspan="2">Mid-Term(2030)</td></tr>
<tr><td colspan="2">1. Restrict government procurement eligibility to companies that adhere to planetary health (PH)-aligned practices.
2. Integrate planetary health criteria into Halal Certification and ISO 14000 standards, extending influence on SMEs along the supply chain and applying Extended Producer Responsibility (EPR) principles.
3. Monitor existing ESG, PH and SDG frameworks; develop unified metrics, tools and guidelines; and communicate the interlinkages clearly to businesses throughout the supply chain.</td></tr>
<tr><td colspan="2">Long-Term (2050)</td></tr>
<tr><td colspan="2">Institutionalise a fully integrated governance ecosystem, where public-private-community partnerships operate seamlessly through state-of-the-art STIE infrastructure, enabling real-time decision-making, predictive analytics and cross-sectoral collaboration for planetary health and sustainability outcomes.</td></tr>
<tr><td>Lead Agencies</td><td>Impact tracking</td></tr>
<tr><td>INTAN, Razak School of Government, GLCs, PRIs, Department of Standards (DOSM), Industry associations, professional bodies, Bursa Malaysia, SME, NGOs</td><td>• Number of toolkits available to businesses.
• Level of awareness on PH/ESG/SDG initiatives (perception surveys).
• Participation in training and leadership programmes.
• Measuring practices of government agencies on green procurement.</td></tr>
</table>

Shift 4: Effective Communication, Behavioural and Values Mindset

This shift focuses on activating government agencies, GLCs and research institutions as champions of planetary health, using targeted communication, behavioural insights and branding to influence public attitudes, empower MSMEs and position Malaysia as a regional leader in sustainable innovation and education.

GOVERNANCE PILLAR: SYSTEMIC SHIFT 4

Strategies	
Mobilise government agencies, GLCs and PRIs to lead by example in driving PH-aligned behaviour across business supply chains, community groups and the public, leveraging emotional appeal and opportunity cost framing.	
Short Term (2027)	
1. Develop diverse communication strategies, using both traditional and digital platforms and content tailored for technical and general audiences, to highlight the ROV of adopting PH practices. 2. Intensify PH communication campaigns and establish support systems, especially for MSMEs and grassroots actors in the supply chain. 3. Establish a compelling national narrative on planetary health using behavioural insights, in collaboration with the Malaysian Productivity Corporation (MPC).	
Long-Term (2050)	
1. Support the international branding of local firms, helping them expand global market access and strengthen partnerships for technology transfer and sustainable innovation. 2. Position Malaysia as a leading regional hub for PH education and research, facilitating foreign direct investment, talent attraction and development cooperation. This includes serving as a platform for Overseas Development Assistance (ODA) in PH- and SDG-related domains.	
Lead Agencies	**Impact tracking**
GLCs, PRIs, IHLs, MITI and MATRADE, RTM, MCMC, Kementerian Komunikasi, NGOs	• Investment channelled to supporting local players to develop communication strategies. • Number of resource centres to support the local ecosystem. • Number of firms and organisations that use these services and the outcomes achieved from accessing these services. Have they improved their dynamic capabilities, market reach, access to new STI and improved their competitiveness (obtained via survey and other data source for DOSM)? • Collection of success stories.

Shift 5: Sustainable Financing and Resourcing Planetary Health Development Initiatives

This shift focuses on establishing innovative, inclusive financing mechanisms that leverage public-private-community partnerships, align incentives with planetary health goals and ensure equitable, performance-based resource allocation across Malaysia's diverse regions and ecosystems.

GOVERNANCE PILLAR: SYSTEMIC SHIFT 5

Strategies	
Develop public-private-community financing partnerships to reduce duplication of resources, improve economies of scale and accelerate the discovery and scaling of innovative PH solutions.	
Short Term (2027)	
1. Identify resource requirements across sectors and regions to support the development of a robust national communication ecosystem, building trust and enabling behaviour-informed decision-making. 2. Integrate opportunity cost considerations into the design of incentive structures. 3. Review and redesign the current financing architecture to ensure equitable distribution of funds and shared responsibility among stakeholders. 4. Introduce incentive-based systems to encourage firms to adopt PH-compliant processes, product innovations and green technologies (e.g., carbon tax, biodiversity bonds, sovereignty funds).	
Mid-Term (2030)	
1. Facilitate resource pooling by federal, state and local governments, with GLC and MNC collaboration, to build and maintain PH infrastructure and service delivery systems. 2. Develop mutually beneficial cost-benefit sharing models between federal and state governments for natural ecosystem management. Explore diversified funding channels such as Sukuk for PH and co-design revenue-sharing frameworks.	
Long-Term (2050)	
Establish long-term funding mechanisms such as endowment funds and "air intake" charges on hydrocarbon combustion to finance STIE initiatives.	
Lead Agencies	**Impact tracking**
MOF, PMO, State government and local councils, NGOs	• Amount of funding obtained for PH development initiatives. • Amount of funds channelled to the different states and districts for PH-related development initiatives. • Development of real-time data (dashboard) for capturing behavioural changes towards PH as new development funds and support services are channelled to the various communities and ecosystems across the country. • Ecological fiscal transfer

Environment and Health

The Environment and Health pillar highlights how closely human well-being is linked to the state of Earth's natural systems. Our air, water, food and overall health depend on clean and thriving natural ecosystems such as forests, oceans and rich biodiversity. These ecosystems regulate the climate, provide clean air and water and support food production, all essential for human health and well-being.

However, human activities are damaging these ecosystems. Urban growth, agricultural expansion, deforestation and pollution from industry and large-scale economies are putting massive pressure on land, water and air. According to the United Nations Department of Economic and Social Affairs, quoting a third party survey in 2017 "more than a third of 50 recently surveyed Nobel Prize winners identified population growth and environmental degradation as the biggest threat to humanity". (Population Matters: 2017)

Urgent action is needed to manage natural resources in ways that protect both current and future generations. Key steps include improving wastewater treatment, reducing plastic pollution and creating cleaner, healthier cities, towns and villages that support physical and mental health. As climate change worsens, building resilient communities that can adapt to environmental changes is crucial to protect health and reduce vulnerability and risk. To reduce health inequalities and improve well-being for everyone, we need to tackle the social, economic and environmental conditions that influence health.

Landscape Insight: Defining Forests

The United Nations Framework Convention on Climate Change (UNFCCC) defines a forest as an area with a minimum size of 0.01 to 1.0 hectares, trees at a minimum height of 2 to 5 meters and a minimum forest cover of 10 to 30 percent. Meanwhile, the Food and Agriculture Organization of the United Nations (FAO) defines a forest as land covering at least 0.5 hectares with tree crown cover exceeding 10 percent and mature trees reaching a minimum height of 5 metres.

There is no universally accepted definition of a forest. The FAO's definition is commonly used and provides a broad classification that simplifies global-scale forest mapping. However, this classification includes plantation crops such as rubber, which are therefore counted as forests. The Malaysian government adopts the FAO definition to determine what qualifies as a forest within Malaysia.

In line with planetary health principles, we must centre our approach on human values and draw on indigenous knowledge. This means putting ethics, social justice and fairness between generations at the heart of decisions about the environment.

Challenges and Insights

Challenge 1: Increasing threat to Malaysia's Biodiversity and Environment.

Malaysia is ranked 12th globally on the National Biodiversity Index, thanks to its rich variety of plant and animal species. However, what remains of the rainforests of Sabah and Sarawak—recognised among the world's most biodiverse—are under serious threat.

According to the Global Biodiversity Outlook 3 report (United Nations, 2010), Malaysia's ecosystems are facing increasing pressure from deforestation, habitat loss and fragmentation, wetland destruction, pollution, overexploitation of resources, acidification of the oceans, invasive species, and climate change.

These threats are already causing lasting damage. As of 2022, the International Union for Conservation of Nature (IUCN) Red List classified 210 plant species in Malaysia as critically endangered, with hundreds more listed as endangered or vulnerable. Almost half of Malaysia's 1,951 freshwater and marine fish species are threatened, mainly due to habitat damage, overfishing and bycatch (Convention on Biological Diversity, 2022).

Deforestation

Officially, 54 percent, or just over half of Malaysia is forested—around 18.2 million hectares—according to official figures (WWF, 2021). However, independent research paints a different picture. The Gaveau Dataset (Gaveau, 2022) estimates that forest cover has fallen to 46.97 percent. Malaysia's higher figure includes both natural forests and plantations (such as rubber and timber), under the FAO definition.
According to the Rimbawatch Report (State of Malaysian Rainforests, 2024) between 2.1 and 3.2 million hectares of natural forests are now at risk, representing up to 16 percent of what remains.

Even though Malaysia still has a large amount of forest cover, much of it is fragmented, breaking up the natural landscape, reducing ecological connectivity and making it harder for animals, especially large mammals, to move freely. Many species struggle to find food, water and mates, leading to genetic isolation and long-term population decline.

One solution is to create ecological corridors that reconnect these fragmented forests. Initiatives such as the Central Forest Spine (CFS), Heart of Borneo and the Kinabalu Ecolinc have been launched to tackle this, but progress has been slow due to three major challenges:

1. Policy and Governance. While some progress has been made in aligning conservation efforts with policy, there is still a gap between environmental goals and national development plans. Better coordination between policy, governance and practice (including enforcement) is needed to integrate biodiversity conservation into land-use planning and broader development frameworks.
2. Major funding shortfalls. Long-term success depends on having enough money for regular maintenance, monitoring and management of the corridors.
3. Lack of precise, up-to-date biodiversity data. Without regular, reliable information on species, habitats and ecosystem connections, it is difficult to properly design or manage ecological corridors, especially in complex landscapes like Borneo and Peninsular Malaysia.

Ecosystem Insight: Malaysia's Commitment to Deforestation

Malaysia has consistently reaffirmed its commitment at international events, such as COP26 in 2021, endorsing the Glasgow Leaders' Declaration on Forests and Land Use, committing to halt and reverse forest loss by 2030.

In recent years, Malaysia's primary forest loss has stabilised driven by both corporate and governmental initiatives. The palm oil sector is now largely governed by No Deforestation, No Peat and No Exploitation (NDPE) commitments, with strengthened certification standards by the Roundtable on Sustainable Palm Oil (RSPO), and the mandatory Malaysia Sustainable Palm Oil (MSPO) certification. Additionally, the government imposed a plantation area cap for oil palm in 2019, which remained in effect until 2023.

Efforts to safeguard forests began with the Third Malaysia Plan (1976-1980) and were reinforced in subsequent plans. The National Green Growth Initiative under the 11th Malaysia Plan recognised forests as carbon sinks, while the 12th Malaysia Plan (2021-2025) focuses on integrating SDG 15 into forest management practices.

Malaysia's participation in the National REDD Plus Strategy, a transboundary climate change initiative, includes implementing a national forest reference level, a monitoring system and safeguards for REDD Plus activities. This strategy aims to align federal and state policies, promote biodiversity conservation and involve indigenous communities and the private sector.

The National REDD Plus Strategy supports the Rio Pledge by offering incentives for maintaining forests while providing environmental, socio-economic and climate change mitigation benefits. Instruments like the Forest Conservation Certificate and Forest Carbon Offset for domestic carbon trading are part of this strategy, although they have yet to be implemented.

Challenge 2: Habitat loss primarily driven by deforestation:

Habitat loss, caused mainly by deforestation for agriculture and road construction, remains a major threat to Malaysia's wildlife. Large-scale forest clearing has led to increased human-wildlife conflicts and extensive damage to the environment. Many iconic species. such as the Malayan tiger, tapir, elephant, orangutan and Sunda pangolin, are losing their natural habitats. Malaysia lost its last Sumatran rhinoceros in 2019 and 48 out of 292 mammal species are now threatened. The leatherback turtle is considered functionally extinct (Fitzherbert et al., 2008).

Practice Insight: Strengthening Accountability in Malaysia's Palm Oil Sector Through NDPE Implementation

Between 1990 and 2005, forest conversion to oil palm plantations accounted for 94 percent of deforestation in Malaysia, with particularly severe impacts in peat swamp forests, resulting in the disappearance of at least 46 forest bird species (Wilcove and Koh, 2010; Koh et al., 2011). These biodiversity losses underscore the environmental costs of unsustainable land use.

Since 2015, however, deforestation rates have declined across major palm oil-producing countries, including Malaysia. According to the Tropical Forest Alliance, this positive trend is due primarily to the widespread adoption of No Deforestation, No Peat, No Exploitation (NDPE) policies. These policies commit companies to:

- Halt and reverse deforestation
- Protect peatlands from further conversion
- Avoid exploitation of workers, smallholders and local communities.

Despite this progress, a critical implementation gap remains: There is no consistent, transparent system to monitor, analyse, interpret and report on progress against NDPE commitments—particularly at the national or subnational level. To bridge this gap, Malaysia urgently needs a locally adapted NDPE Implementation and Reporting Framework.

Such a framework should:

- Define clear, standardised indicators and benchmarks
- Enable independent verification and public disclosure of compliance
- Be adaptable to local socio-ecological conditions and business realities
- Align with global best practices while reinforcing national sustainability goals.

This framework would help restore trust, expand market access and position Malaysia as a regional leader in sustainable commodity governance.

Wetland loss:

Around 29 percent of Malaysia's 4,000 km coastline is severely impacted by environmental challenges, including habitat loss, increased CO2 emissions, species extinction and coastal erosion. Mangrove forests, which help protect coastlines by stabilising shorelines and reducing storm damage, face growing threats from expanding agriculture and aquaculture (Omar et al., 2018).

Peatlands, another important wetland type in Malaysia, are also at risk. They play a critical role in supplying water, reducing floods, storing carbon and supporting biodiversity, making their protection essential for both human and planetary wellbeing.

Ecosystem Insight: Strengthening Wetland Conservation in Malaysia

Malaysia's wetlands, vital ecosystems for biodiversity, flood regulation and climate resilience, are governed by a patchwork of policies, most notably the National Wetland Policy (2005) under the umbrella of the Malaysian Biodiversity Policy. However, conservation efforts face persistent systemic barriers to impact at scale.

Key Barriers:

- Policy Conflicts: Contradictions between the National Wetland Policy and other instruments—such as the Land Use Policy—undermine conservation objectives. For example, taxation of unused land creates economic pressure to convert wetlands to e.g. oil palm cultivation (Olorunfemi, 2017).
- Fragmented Governance: Malaysia's federal structure complicates wetland protection. States control land and forests, while wildlife and national parks fall under concurrent federal-state jurisdiction. This division hampers coordination, enforcement and integrated management.
- Funding Shortfalls: Dedicated financing for wetland conservation is limited, resulting in inadequate management, monitoring and restoration capacity.
- Low Public Awareness and Climate Blind Spots: The value of wetlands—particularly in the context of climate adaptation, carbon storage and disaster risk reduction—is largely overlooked in public discourse, policymaking and planning processes.

Strategic Priorities:

- Reinforce and harmonise existing laws to remove contradictions between conservation and development policies.
- Offer alternative livelihoods to communities dependent on wetland conversion, especially in palm oil-dominated landscapes.
- Increase and diversify financial support for wetland protection, including through ecological fiscal transfers, green bonds, or conservation trust funds.
- Raise public awareness of the ecological and economic value of wetlands, while embedding climate resilience into wetland governance at all levels.

Safeguarding Malaysia's wetlands will require a whole-of-government and whole-of-society approach, with strong legal backing, adequate funding and active participation from state governments, indigenous and local communities and the private sector.

Marine and Ocean Acidification

Malaysia's marine ecosystems are under serious threat from overfishing, marine pollution and coastal development, placing immense pressure on critical habitats such as mangroves and coral reefs. These issues also affect fishing communities and national food security. In addition, the mining of marine sand and aggregates degrades seabed ecosystems and threatens marine biodiversity.

National coral reef surveys have highlighted a decline in coral reef health, particularly in unprotected areas. Between 2015 and 2018, there was a drop in live coral cover (LCC), along with rising algae growth and fewer fish and invertebrates. The 2022 Reef Check Malaysia Report showed a slight improvement in LCC to 47.83 percent, up from 44.26 percent in 2021, which was likely due to reduced tourism during the COVID-19 pandemic. These findings raise an important question about the potential benefits of temporary site closures for reef recovery.

Despite the recovery in coral cover, fish and invertebrate populations remain depleted, even inside Marine Protected Areas (MPAs). This is due to historical overfishing and continued human impacts including tourism, development and insufficient enforcement.

Practice Insight: Aspiring to Shape a Sustainable Blue Economy

Malaysia has integrated SDG 14: Life Below Water into its national development agenda, beginning with the 11th Malaysia Plan and continuing in the Twelfth Malaysia Plan (2021–2025), which prioritises the blue economy as a key strategic focus.

The blue economy refers to a holistic model of marine resource governance that supports sustainable development, improves human well-being, promotes social equity and reduces environmental harm and ecological degradation.

Landscape Insight: Rich Marine Resources: A Foundation for Malaysia's Blue Economy

Malaysia's extensive coastlines and islands are home to three vital coastal ecosystems—coral reefs, mangroves and seagrass beds—which provide essential ecological, economic and social benefits. These ecosystems support fisheries, tourism, climate resilience and coastal protection.

Coral Reefs: Malaysia hosts approximately 4,006 km² of coral reefs within the Coral Triangle, the global epicentre of marine biodiversity. These reefs harbour over 77 percent of the world's known coral species.

In Sabah, the Marine Ecology Research Centre (MERC) operates a reef monitoring facility on Pulau Gaya. Its Autonomous Reef Monitoring Structure (ARMS) is the first ocean acidification monitoring station in Southeast Asia, tracking seawater temperature and acidity in response to global warming.

Mangroves: Located along inner coastal zones, mangroves are essential for shoreline stabilisation, carbon storage and supporting marine biodiversity.

Seagrass Beds: Found in shallow intertidal areas, seagrass meadows provide nursery and feeding grounds for juvenile fish, migratory birds and marine mammals.

Together, these ecosystems are the cornerstone of Malaysia's marine wealth—underpinning livelihoods, food security and national resilience.

Ecosystem Insight: Strengthening Malaysia's Blue Economy

Malaysia's blue economy is constrained by the lack of a coherent national ocean policy and marine spatial plan, overlapping jurisdictions, limited skilled labour and logistics and insufficient data and technical expertise. Conflicting federal-state authority also undermines marine governance.

Key threats include illegal fishing, marine pollution and climate change impacts on ecosystems. Balancing economic growth with environmental protection continues to pose a major challenge. Despite this, the government is committed to improving marine resource management.

Strategic Priorities:

- Establishing a National Ocean Policy and Marine Spatial Plan
- Expanding Marine Protected Areas
- Promoting sustainable fisheries and pollution control
- Integrating climate adaptation into marine planning
- Strengthening inter-agency coordination
- Investing in research, innovation and workforce development

A coordinated, science-based approach is essential to achieve a resilient and sustainable blue economy.

Pollution:

Air pollution levels in Malaysia are higher than the World Health Organization guidelines permit. On average the PM2.5 concentration (fine particles harmful to human health) is around three and a half times higher than the WHO's annual air quality guideline. Over the past decade, PM2.5-related deaths in Malaysia have increased by nearly 30 percent, with around 10,600 deaths linked to air pollution in 2019 (Centre for Research on Energy and Clean Air, 2022 citing State of Global Air 2020 and Institute of Health Metrics and Evaluation, IHME 2020). Major sources of air pollution include industrial activity, power plants, motor vehicles and open burning from homes, businesses and farms.

The problem is made worse by seasonal haze, a transboundary issue that has affected Southeast Asia for decades. Major haze events in 1997 to 1998, 2006 and 2015, particularly during El Niño years, have caused widespread health problems and major economic losses. This haze is caused by biomass burning for land clearing and contributes to climate change (Seah and Varkkey 2023; UNDRR 2006). To address this phenomenon, Malaysia is working on a law like Singapore's Transboundary Haze Pollution Act (2014), aimed at holding polluters accountable across borders.

Landscape Insight: The Hidden Costs of Air Pollution: A Heavy Economic Burden on Malaysia

Air pollution in Malaysia carries a staggering economic cost, yet it remains underacknowledged in policymaking. Poor air quality leads to higher healthcare expenditure, lost productivity and premature deaths—all of which have significant financial consequences.

According to the Centre for Research on Energy and Clean Air (2022), air pollution imposed an estimated economic burden of MYR 303 billion (US$ 73 billion) in 2019—equivalent to 20 percent of Malaysia's GDP. This translates to roughly MYR 9,250 (US$ 2,200) per person, reflecting direct and indirect costs from pollution-related health issues.

The consequences are substantial:

- Reduces economic output by affecting workforce participation and increasing healthcare costs
- Worsens health disparities, especially among vulnerable populations
- Strains national health systems and social protection mechanisms

Investing in cleaner technologies, stricter air quality standards and cross-sectoral pollution control policies is not just a public health imperative—it is a strategic economic investment. Reducing air pollution will yield long-term savings, improve quality of life and drive sustainable development.

Water pollution

The country produces over 2.97 billion cubic meters of wastewater annually (Mat et al. 2013). Untreated or poorly regulated discharge from households and industrial facilities continues to degrade water quality, creating serious risks to public health and ecosystems.

Since the Covid-19 pandemic and the lifestyle shifts it triggered, water pollution has increased through greater discharge of disinfectants, soaps and medicines, along with rising levels of microplastics—a pollutant of urgent global concern—found in Malaysian rivers and commercial fish stocks (Yoon et al. 2023).

Another growing issue is the bioaccumulation of toxic metals. Activities like farming, industrial processing and urban development are major contributors to heavy toxic metal pollution in coastal areas. A study found worrying levels of lead, mercury, cadmium, arsenic, copper, zinc, chromium and nickel in coastal sediments around Peninsular Malaysia (Yunus et al. 2020).
Malaysia needs tighter regulation of industrial waste discharge—particularly from processing plants—and stronger efforts to recover and recycle hazardous metal-containing waste.

Ecosystem Insight: Fragmented Governance Weakens Water and Waste Management

Malaysia's SPAN Act (2007) provides a national framework for water resource management, covering river systems, clean water supply and sanitation. The government also uses a Water Quality Index (WQI) to track river pollution based on indicators like oxygen levels, organic content and acidity (DOE, 2020).

However, fragmented institutional responsibilities continue to weaken water and waste governance. Different types of waste fall under separate agencies:

- Sewerage – Indah Water Konsortium (IWK)
- Scheduled waste – Department of Environment
- Solid waste – SWCorp or local authorities
- Agricultural and mining waste – various other bodies

This siloed structure hampers cross-sector coordination, reduces accountability and impedes efficient service delivery.

An integrated, urgent response is needed to secure safe drinking water, improve wastewater management and strengthen governance across the full water and waste cycle.

Xenobiotics

Xenobiotics—chemical substances from industrial processes, pharmaceuticals and agriculture—are an increasing threat to ecosystems, food safety and water quality. They include endocrine-disrupting chemicals (EDCs), which can interfere with hormonal systems in humans and animals. Climate change exacerbates the spread and concentration of EDCs in the environment, further damaging water quality and ecosystem health (Coppens et al., 2015; Chiu et al., 2017; Wee et al., 2019).

A key challenge is that many drinking water treatment plants do not fully remove EDCs and long-term health impacts remain poorly understood. A study of the Langat River, one of Malaysia's main water sources, detected 14 different EDCs—raising serious concerns about treatment effectiveness and the risk of human exposure (Wee et al., 2019).

Plastics

Plastic pollution remains a major challenge, with Malaysia releasing an estimated 140,000 to 370,000 tonnes of plastic into the oceans each year (Jambeck et al., 2015). While Malaysia imported nearly 500,000 tonnes of plastic waste in 2021—including illegal shipments—this is set to change: from July 2025, stricter import controls will ban plastic scrap unless it meets high purity standards, passes pre-export inspections and complies with the Basel Convention, signalling a firmer stance on waste dumping and environmental protection.

Ecosystem Insight: Strengthening Malaysia's Plastic Waste Governance

Malaysia has introduced two key frameworks to address plastic pollution:

- The Roadmap Towards Zero Single-Use Plastics (2018–2030)
- The Plastics Sustainability Roadmap (2021–2030)

Both aim to reduce plastic waste and promote circularity, but implementation gaps persist. These include limited public compliance, weak enforcement, inadequate recycling infrastructure and a lack of viable alternatives.

Compounding the issue, Malaysia was briefly the world's top importer of plastic waste after China's 2018 ban. Although a national ban was announced the same year, it was reversed in 2021, undermining confidence in Malaysia's long-term commitment.

Addressing plastic pollution will require consistent policy enforcement, transparent waste management and greater investment in circular economy solutions.

Zoonosis and Vector-borne Diseases:

The Nipah virus outbreak in Malaysia in 1998 is a stark example of how environmental changes can lead to disease. It was linked to deforestation, which displaced bats, the natural host of the virus. The bats came into close contact with pig farms and people living and working on the farms, triggering a deadly outbreak that affected 300 people, caused more than 100 deaths and led to economic losses of around USD 582 million (FAO, 2002).

There is clear evidence that land use changes, such as forest clearance, are driving new disease risks. In Sabah, deforestation has been linked to a rise in malaria cases, especially zoonotic malaria caused by novel pathogens such as *P. knowlesi.* As forests shrink, human contact with mosquitoes that carry these pathogens increases, leading to higher incidence rates (Fornace et al., 2016; Cooper et al., 2020). In addition, *P. cynomolgi,* another simian malaria parasite, has also begun infecting humans, posing a new challenge to Malaysia's malaria eradication efforts. (Ta et al., 2014; Law, 2018).

If current rates of deforestation continue, Malaysia could face economic losses of over USD 4.35 trillion by 2030, considering the social cost of carbon, loss of ecosystem services and malaria-related healthcare costs (EcoHealth Alliance, 2019). To reduce these risks, Malaysia must improve zoonotic disease surveillance and adopt integrated climate- and health-conscious land-use policies.

Challenge 3: Knowledge Gaps in the Interconnections Between Environmental Health, Human Well-Being and Economic Prosperity

There is a worrying lack of understanding in Malaysia about how environmental health connects to human well-being and economic outcomes. While many corporate leaders are aware of environmental issues most do not fully understand how their business activities affect planetary health and human health (Appendix 1).

At the community level, survey data shows a similar problem. While many Malaysians believe they can improve the health of the planet; nearly 46 percent say they are unwilling to change their behaviour because they feel others will not do the same (Appendix 2). This sense of futility weakens collective action and progress.

This gap in awareness is made worse by a shortage of experts in environmental and health sciences, which limits efforts to design and deliver effective education and training programmes.

As a result, this knowledge deficit affects all levels of society:

- Policymakers struggle to create integrated environmental and health strategies.
- Businesses often overlook the impact of their operations. Industry leaders frequently fail to fully embed sustainable practices.
- The public remains unaware of how deforestation, pollution and climate change harm health.

This disconnect makes it harder to gain public support and implement effective policies, without which efforts to protect both the environment and human health will fall short.

Landscape Insight: Linking Environmental Health to Economic Resilience

Neglecting environmental health has far-reaching economic consequences. Natural resource degradation, biodiversity loss and pollution-related health costs all weaken Malaysia's long-term economic resilience and social stability.

To address these interlinked challenges, Malaysia must adopt a holistic approach that integrates education, policy and environmental management. Key priorities include:

- Embedding environmental and planetary health into the national education curriculum
- Scaling public awareness campaigns to highlight the health–environment connection
- Fostering collaboration across environmental science, public health and policy sectors

By closing the knowledge gap and strengthening public understanding of how environmental and human health are interconnected, Malaysia can protect its ecosystems, improve population health and lay the foundation for sustainable economic growth.

Challenge 4: Aligning Business Operations to Environmental and Public Health Amidst Cost and Ecosystem Barriers

Many business leaders in Malaysia recognise that environmental problems affect human health. But most do not understand how their operations contribute to these risks. Several barriers stand in the way of action. Smaller firms find it too expensive to adopt sustainable practices. Others lack incentives, funding, or clear regulatory guidance from either government or non-state actors. Many companies also do not perceive quick benefits from investing in sustainability, so they focus on short-term profits instead.

This mindset is short-sighted. It increases risks from environmental shocks, weakens public health and causes businesses to miss fast-growing green markets. To change this, Malaysia needs a joined-up approach. Business leaders, their staff and new entrants to the workforce need education and support to understand how sustainability links to long-term profit and resilience. Policies and incentives must reward good environmental and health practices. Regulations must be fair and clear.

Making environmental and public health part of everyday business is not a cost—it's an investment in the future of the economy and the well-being of all Malaysians.

Ecosystem Insight: The Economic Case for Forest Conservation in Malaysia

Malaysia's forests—part of the Sundaland biome, one of the world's largest—provide critical ecosystem services that underpin environmental stability and human well-being.

According to EcoHealth Alliance USA (2019), working with Malaysian partners, the average annual value of ecosystem services in Southeast Asian tropical forests is estimated at USD2,365 per hectare, based on 38 studies from the TEEB dataset.

Breakdown of estimated annual values per hectare includes:

Item	USD
Climate regulation	677
Energy provision	454
Erosion control	365
Water supply	316
Food provision	134
Extreme event regulation	119
Raw materials	116
Gene pool provision	75
Pollination	46
Recreation	33
Water flow regulation	17
Medicinal resources	5

Notably, the containment of zoonotic diseases is emerging as a vital, yet often overlooked, ecosystem service. Research in Malaysian Borneo found the cost of treating a single malaria case can exceed USD 5,000, in some areas surpassing the budget allocated for malaria prevention, highlighting the growing burden of ecological disruption on public health systems.

The long-term costs of inaction, including biodiversity loss, climate impacts and disease burdens, far exceed the short-term profits of deforestation. Protecting forests is not only an environmental imperative but an economically rational and health-protective investment.

Challenge 5: Connecting Actions to Their Impact on the Health of People and the Environment

There is a growing awareness among people and businesses about how the environment affects health and society. However, many still do not fully understand how their own actions affect the environment and, in turn, health and human well-being. This gap in understanding makes it harder for them to truly take part in pro-planet behaviours or values-based initiatives.

This gap causes several problems:

- Ineffective Actions: People may believe they are making environmentally friendly choices, but without an informed understanding, these efforts are often too small or off-target.
- Superficial Engagement: Businesses may take on sustainability efforts just for show or because it is "the right thing to do", but without a true commitment to the longer-term changes needed to support planetary health.
- Resistance to Change: When the impact of their behaviours is unclear, both individuals and businesses are more likely to resist adopting more sustainable practices, seeing them as unnecessary or too difficult.

As a result, society struggles to deal with environmental and health challenges in a meaningful way. This weakens efforts to protect the environment, improve public health and meet sustainability goals—leading to disjointed and less effective outcomes.

Challenge 6: Lack of Funding and Resources for Sustainable Environmental Health Initiatives

Even though awareness is growing about how environmental damage harms health and quality of life, many individuals and businesses feel stuck. They want to act but face practical barriers, particularly regarding money and support. These challenges make it hard to shift towards behaviours and investments that protect the planet and public health.

1. **High Costs of Transition:** Moving towards more sustainable ways of living and working often requires substantial financial investment in new technologies, processes and materials.

    - For businesses, this might include upgrading to more energy-efficient systems, reducing waste, or shifting to sustainable sourcing practices.
    - For individuals, even simple steps, such as purchasing eco-friendly products, can be too expensive, especially when living costs are high.

    Smaller businesses are especially affected, as they often lack the capital to invest in new technologies or green alternatives. Without financial help or clear incentives, these costs become a major barrier to change.

2. **Lack of Adequate Support Systems:** Many people and businesses want to do more for the environment but do not know where to start. There is often no one to turn to for guidance.

    - Technical assistance is limited, so companies are unable to obtain the expert advice they need to make the right changes.
    - Financial support, such as grants, subsidies or low-interest loans for sustainable investments, is not widely available or easy to access.
    - Information and training on how to be more sustainable is also lacking. People are unsure what works, what does not, or what steps are most important.

    Without stronger support systems, both individuals and companies are left to figure it out on their own, which slows progress and increases frustration.

3. **Perceived Ineffectiveness:** Even those who care deeply about environmental issues often feel that their efforts will not matter in the grand scheme of things.

    - If they are unable to see visible results or hear success stories, discouragement is likely to follow.
    - For businesses, the lack of clear, measurable returns from sustainability investments can make these efforts seem like a financial risk rather than a benefit.

    This sense of helplessness leads to inaction—even when the intention to do better is there.

4. **Inertia and Resistance to Change:** Change is hard, especially when current systems and routines feel familiar and safe.

    - Many businesses fear that changing how they operate will disrupt workflows, raise costs, or introduce new risks.
    - Individuals may also hesitate to change long-standing habits, especially if it means sacrificing comfort or convenience.

    Without strong incentives—or clear reasons that speak to personal or business interests—there is little motivation to move away from the status quo.

5. **Limited Integration with Business Models**: In many companies, sustainability still sits on the sidelines rather than being built into core operations.

    - Business models are often focused on short-term profits and environmental goals can seem like a costly distraction.
    - In competitive sectors, firms may feel that “going green” puts them at a disadvantage, especially if customers are not demanding it.

    This lack of integration makes it difficult to justify the time and cost needed to make real environmental improvements, especially in industries where margins are already tight.

6. **Structural and Policy Barriers:** Even the most committed businesses and individuals can only do so much without the right policy environment.

    - Many of Malaysia's current laws and regulations are too weak, fragmented, or outdated to support meaningful environmental action.
    - There is often no clear roadmap, no minimum standards and no consistent support for those trying to transition to more planet-friendly practices.

    Without stronger policies, enforcement and incentives from government, people are left to do this work alone and many simply cannot.

Practice Insight: Financing Conservation Through Innovation and Sectoral Partnerships

Malaysia's National Policy on Biological Diversity 2016–2025 (NPBD) highlights the importance of innovative conservation financing, including mechanisms such as:

- Payments for Ecosystem Services (PES)
- Carbon credits and biodiversity offsets

The Sarawak Forest Department's Strategic Plan (2021–2025) supports these approaches, while the State Government has allocated MYR 62 million under the 12th Malaysia Plan for forest restoration (Tawie, 2021).

To scale impact, stronger private sector and financial sector engagement is essential. The Bank Negara-led Joint Committee on Climate Change (JC3), through its Sub-Committee on Bridging Data Gaps, is working to improve data on nature-related financial risks. This will enable better analysis of:

- How the financial system contributes to biodiversity loss
- The implications of ecosystem degradation on financial stability

Aligning finance with conservation goals is critical to building a climate-resilient, nature-positive economy.

The Systemic Shifts for Environment and Health

Malaysia's current trajectory reveals that environmental sustainability and human health are treated as parallel but disconnected agendas. This fragmented approach has left gaps in policy coherence, weakened institutions and limited the country's ability to safeguard both ecosystems and public wellbeing. To shift course, a systemic transformation is required; one that integrates environmental stewardship with health equity as mutually reinforcing goals. This framework sets out the strategies, actions and accountability mechanisms that will enable Malaysia to achieve this alignment, ensuring resilient ecosystems, healthier populations and a sustainable future.

Table 3-1: Environment and Health – Current and Future States

Current State	Future State
Malaysia is facing significant environmental and human health challenges. The country has contributed to the global breach of planetary health boundaries, including widespread deforestation, pollution and accelerating climate change.	Malaysia has a robust and advanced ecosystem capable of anticipating and mitigating environmental and health risks. Planetary boundaries are respected, and environmental pressures are significantly reduced.
These pressures have heightened the risk of both communicable and non-communicable diseases.	The incidence of environment-related communicable and non-communicable diseases is significantly reduced.
The existing Science, Technology, Innovation and Economy (STIE) ecosystem lacks the capacity to support environmentally and health-friendly innovations, industries and job creation.	The STIE ecosystem is sophisticated and well-equipped to foster planetary health-friendly innovations, industries, foreign direct investment (FDI) and job creation.
Contributing factors include uncoordinated policies, inadequate funding, limited stakeholder collaboration and a preference for cheap foreign technologies over local innovation.	A coordinated, multi-sectoral approach is in place, involving government, research institutions, businesses and civil society to support local innovation and investment aligned with planetary health goals.
Progress toward SDGs is constrained by weak systemic support for planetary health.	Significant progress is made toward achieving the SDGs through a planetary health lens.

Five Systemic Shifts for Environment and Health

Towards a healthier and more sustainable future, five systemic shifts are recommended to address the give challenges documented in the earlier section.

	1	2	3	4	5
	Strengthening the Governance and Management of the Nation's Natural Khazanah	**Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation**	**Planet-Friendly Businesses**	**Effective Communication, Behavioural and Values Mindset**	**Sustainable Financing and Resourcing Planetary Health Development**
FOCUS	Establish a high-level coordinating body for environmental governance.	Bridge the knowledge gap.	Enable MSME transition through targeted support for environment- and human-friendly innovation.	Develop a robust communication strategy to enhance public understanding of Planetary Health.	Strengthen support systems to improve access to sustainable financing for planetary health adoption.
CORE ELEMENTS	Elevate environmental biodiversity as a national security priority. Incorporate Indigenous and local community input in policy decisions. Strengthen partnerships between Federal and State Governments.	Advance education for sustainable development. Implement planetary health leadership programmes. Promote entrepreneurship with a focus on planetary health.	Intensify awareness-raising among businesses on planetary health and sustainability. Establish hand-holding mechanisms to guide micro and small enterprises through the transition to sustainable practices. Strengthen the RDICE ecosystem for innovation and long-term support for micro and SMEs.	Deploy diverse communication modalities to strengthen planetary health awareness. Co-design research and planetary health narratives. Strengthen public education and engagement to build widespread support for planetary health.	Identify and promote existing resources to support the transition to PH-friendly behaviours. Leverage knowledge brokers to enhance adoption of planetary health. Scale up or, where needed, establish green financing mechanisms to drive the planetary health transition

Figure 3-8: Five Systemic Shifts of Environment and Health

Action Plans, Lead Agencies and Impact Tracking

Shift 1: Strengthening The Governance and Management of the Nation's Natural *Khazanah*

This shift focuses on strengthening integrated environmental governance by establishing a high-level coordinating committee, elevating biodiversity to a national security concern and enhancing federal-state collaboration. It promotes inclusive land-use decisions, legal reform and disaster risk planning, with active involvement of indigenous communities, and a stronger focus on enforcement, resilience and policy coherence.

ENVIRONMENT and HEALTH PILLAR: SYSTEMIC SHIFT 1

Strategies	
Establish a High-Level Coordinating Committee. Set up a committee at the parliamentary level to lead integrated environmental governance and natural resource management across sectors and government levels.	
Short Term (2027)	
1. Make Environmental Biodiversity a National Security Priority Treat environmental health as a national security issue due to its link with public health and economic stability. Mainstream environmental issues into national policies and development plans. **2. Include Indigenous and Local Communities in Land Use Decisions** Ensure participation of Indigenous and local communities in land-use and environmental management through formal mechanisms. Apply circular economy models and new technologies to support sustainability.	
Mid-Term (2030)	
1 Strengthen Federal-State Partnerships Enhance cooperation between federal and state governments to improve resource allocation and ecosystem management. Sign formal agreements to build state-level capacity. **2 Develop Disaster Risk Mitigation and Adaptation Plans** Create comprehensive risk management strategies, including early education and integration into emergency systems. **3 Strengthen the Legal Framework** Update environmental laws to include stricter regulations and penalties. Increase enforcement resources for better natural resource protection	
Lead Agencies	**Impact tracking**
PMO, MOHE, MOSTI, PETRA, MAFS, KKDW, NRES, Department of Environment (DOE), Ministry of Communications (MoC), National Parliamentary Group	• Compliance with environmental sustainability policies. • Level of coordination and policy integration across agencies. • Number of environmental health programmes introduced. • Engagement levels in research on environmental sustainability • Number of funded Environmental R&D Projects • Workshops and Training Sessions Conducted • Water quality index compliance levels. • Frequency of ecosystem health assessments. • Adoption rate of sustainable agriculture practices. Levels of agrochemical residues in soil and water. • Community participation levels in environmental programmes. Effectiveness of localised environmental management strategies.

ENVIRONMENT and HEALTH PILLAR: SYSTEMIC SHIFT 1	Lead Agencies	Impact tracking
		• Number of compliance inspections conducted. Incidents of environmental violations in natural resource sectors. • Pollution level compliance rates.Frequency and outcomes of environmental audits. Reach and engagement levels of awareness campaigns. Public attitude changes measured via surveys. • Number of environmental bills passed. Level of alignment with national environmental priorities. • Planetary boundaries compliance. Extent to which Malaysia remains within safe operating space for key Earth system processes (e.g. climate change, biodiversity loss, nutrient cycles). • Environmental Performance Index (EPI) ranking. Malaysia's position relative to other countries in environmental health and ecosystem vitality. • Biodiversity intactness score. Proportion of original species and ecosystem functions remaining across Malaysian ecosystems. • Land and forest cover change. Annual rates of deforestation, afforestation and land-use conversion tracked over time. • Pollutant concentrations in soil, air and water. Measured levels of microplastics, heavy metals, pesticides and antimicrobials across priority monitoring sites. • Air, water and marine quality indices. Trends in environmental quality across ecosystems, based on compliance with national and international standards. • Incidence of environment-linked diseases. Rates of respiratory, waterborne and vector-borne illnesses associated with environmental degradation. • Direct vs. upstream impact separation. Distinction between immediate effects (e.g. factory emissions) and longer-term or systemic impacts (e.g. climate-related health burdens), to support more targeted interventions.

Shift 2: Nurturing People to Lead a Healthy, Prosperous and Values-Driven Nation

This shift focuses on embedding planetary health into education, leadership and public awareness by creating an expert advisory group, redesigning curricula and empowering local communities. It aims to foster cultural relevance, behavioural change and whole-of-society engagement through CEPA initiatives, green entrepreneurship and inclusive leadership programmes that align human and environmental wellbeing.

ENVIRONMENT and HEALTH: SYSTEMIC SHIFT 2

Strategies

Establish a Planetary Health Advisory Group
Create an expert group to close the gap between planetary health, human health and economic planning.

Short Term (2027)

1. **Embed Planetary Health in Education**
   Redesign the national curriculum at all levels to include planetary health, linking human actions to environmental and health outcomes.

2. **Launch Leadership Programmes**
   Train public and industry leaders to prioritise sustainability and health in their decisions.

3. **Support Green Entrepreneurship**
   Encourage start-ups with a focus on eco-friendly businesses, especially eco-tourism linked to environmental care.

Mid-Term(2030)

1. **Develop CEPA Programmes**
   Work with councils, CSOs and religious groups to raise public awareness and promote healthy, planet-friendly lifestyles (e.g., bike lanes, parks).

2. **Distribute Online PH Content**
   Create affordable online materials for educators, policymakers and influencers to boost planetary health knowledge.

Long-Term (2050)

1. **Ensure Continuous Programme Improvement**
   Regularly update CEPA, education and training programmes based on feedback and new technologies.

2. **Incorporate Indigenous and Local Knowledge**
   Include indigenous voices in the advisory group and learning materials to strengthen cultural relevance and environmental stewardship.

Lead Agencies	Impact tracking
PMO, MOH, MOE and MOHE, MOSTI, NRES and DOE, MAFS, KKDW, MoC, Industry Associations and Community Organisations, National Parliamentary Group (Whole of Government), KPWKM, Faith Leaders, Indigenous Groups and Agencies, NGOs and CSOs, KBS	• National integration of planetary health into development agendas. • Coordination level between agencies. • Quality of health-related data and insights provided. • Integration of planetary health into public health policies. • Number of planetary health-related educational modules introduced. • Percentage of students and educators engaged in sustainability programmes. • Number of environmental technology solutions developed. • Adoption rate of innovations in public and private sectors. • Compliance with environmental regulations. • Frequency of environmental audits and policy enforcement..

ENVIRONMENT and HEALTH: SYSTEMIC SHIFT 2	Lead Agencies	Impact tracking
		• Rate of adoption of sustainable agriculture practices. • Reduction in the environmental impact of agriculture. • Community participation in planetary health initiatives. • Effectiveness of partnerships with local governments • Reach and engagement levels of awareness campaigns. • Public attitude changes measured via surveys. • Number of eco-tourism initiatives developed. • Impact of tourism on local communities and environment. • Number of sustainable land use policies implemented. • Rate of biodiversity protection and recovery. • Engagement levels in implementation initiatives. • Adoption rate of recommendations by businesses and communities. • Number of environmental bills passed. • Alignment of laws with planetary health goals. • Number of policies addressing social impacts of planetary health. • Level of integration of gender and family considerations. • Number of faith-based initiatives supporting planetary health. • Public outreach and awareness within religious communities. • Number of Indigenous-led planetary health initiatives. • Cultural relevance and inclusion of Indigenous practices. • Number of grassroots initiatives supported. • Feedback provided on the implementation of recommendations. • Number of youth-led planetary health projects. • Engagement levels of youth in sustainability education

Shift 3: Planet-Friendly Businesses

This shift focuses on empowering micro and SMEs—particularly in less industrialised states—to adopt environment- and health-friendly technologies through tailored support, incentives and capability-building. It aims to integrate ESG, SDG and planetary health goals into business models by strengthening talent pipelines, certification access, public-private collaboration and the RDICE innovation ecosystem.

ENVIRONMENT and HEALTH: SYSTEMIC SHIFT 3

Strategies

Support micro and small enterprises in less industrialised Malaysian states to transition towards environment- and human-friendly technologies and business models through a targeted, multifaceted approach that addresses their specific structural and capacity-related challenges.

Short Term (2027)

1. **Support Micro and Small Businesses in Less Industrialised States**
   Help businesses adopt environment- and health-friendly technologies through tailored, practical solutions.
2. **Raise Awareness Among Micro and SMEs**
   Launch nationwide campaigns to inform businesses about available support, including subsidies, grants, tax breaks and infrastructure access. Use workshops, webinars and targeted outreach.
3. **Invest in Talent Development**
   Promote the business value of PH-friendly skills. Use case studies to show long-term gains.
4. **Provide "Handholding" Support via Agencies**
   Pair businesses with government agencies, research institutes and universities for step-by-step guidance.
5. **Assist with Certification and Award**s
   Simplify access to green certifications and reward businesses achieving them.
6. **Improve Business Capabilities via IHLs/PRIs**
   Enable SMEs to use high-end research facilities and offer capability-building programmes tailored to workplace health, green entrepreneurship and sustainability.
7. **Set Up a "One-Stop Shop" for PH-Friendly Business Support**
   Create a central hub (physical or virtual) offering access to PH-related resources, ESG/SDG guidance and government incentives.

Mid-Term(2030)

1. **Support ESG, SDG and PH Integration**
   Develop unified strategic and communications frameworks linking ESG, SDG and PH goals. Provide clear guidelines and support for adoption.
2. **Strengthen the Innovation Ecosystem (RDICE)**
   Localise proven models like Small Business Innovation Research (SBIR) and Science Technology Transfer Research (STTR) to fund and support PH-focused innovations by SMEs. Encourage collaboration with universities and research institutes.
3. **Ensure Long-Term Support for Innovation**
   Secure consistent funding, facilities and talent pipelines to support PH research and innovation

Long-Term (2050)

1. **Sustain RDICE Ecosystem for Long-Term Impact**
   Secure long-term research funding, build dedicated facilities (labs, hubs) and implement talent development pipelines for PH-focused innovation.
2. **Establish Public Health Professional Groups**
   Encourage formation of PH-focused associations to advocate for integrated policies, support research and spread best practices. Strengthen government-industry-health sector collaboration.

Lead Agencies	Impact tracking
MOSTI, MITI, MSME Development agency, Industry Associations and Business Chambers, MGTC, NRES, DOE, PETRA	• Number of Toolkits Available to Businesses • Level of Awareness on PH/ESG/SDG Initiatives (Perception Surveys). • Participation in Training and Leadership Programmes • Adoption of PH/SDG /ESG Frameworks and Business Models • Number of Local R&D Initiatives Adopted by Businesses (Commercialisation of Local Patents and Innovations): • Number of Collaborations Among Businesses, IHLs and PRIs

Shift 4: Effective Communication, Behavioural and Values Mindset

This shift focuses on bridging the awareness gap between environmental actions and planetary health boundaries through inclusive, multi-platform communication strategies. It promotes public engagement by embedding PH in education, leveraging media and religious networks and encouraging behaviour change through relatable storytelling, annual dialogues and community-driven campaigns.

ENVIRONMENT and HEALTH: SYSTEMIC SHIFT 4

Strategies

To address the gap in understanding the connection between actions and planetary health (PH) boundaries, a robust communication strategy will be developed

Short Term (2027)

1. **Develop Diverse Communication Approaches**
   Use a mix of platforms to explain how environmental wellbeing affects human health: Use popular media such as talk shows, children's cartoons and online videos to share messages on planetary health. Set up dedicated "green desks" in media agencies to focus on environmental reporting. Work with social media influencers to expand outreach and promote PH messages.
2. **Co-Design Research and Narratives**
   Collaborate with scientists, educators and media professionals to create stories that make planetary health relatable and easy to understand. Involve a wide range of stakeholders in shaping communication materials.
3. **Host Annual Government Dialogues on PH**
   Provide platforms for public input and dialogue on environmental concerns. Use social media and fact-checking tools to support transparent and informed participation.
4. **Educate the Public on Green Choices**
   Encourage environmentally friendly habits in daily life, such as greener purchases, services and waste practices. Emphasise the health benefits of sustainable choices and the risks of environmental harm.

Mid-Term(2030)

1. **Develop and incorporate PH into education curricula.**
   Work with education ministries to embed planetary health themes into school and university curricula—covering sustainability, environmental and health impacts—and support this with annual PH Awareness Weeks (competitions, debates, projects) and scholarships for advanced study in PH-related fields.

Long-Term (2050)

1. **Partner with Interfaith Groups**
   Collaborate with religious communities to spread PH messages as part of shared moral responsibility.

Lead Agencies	Impact tracking
MoC, MOHE, Ministry of Religious Affairs, State Ministries and Local Authorities, MOH, DOE, Bank Negara Malaysia, Bursa Malaysia	• Reach and engagement rate of campaigns. • Number of media channels used. • Number of PH-related modules introduced. • Participation rate in PH workshops and programmes. • Number of religious leaders engaged. • Community engagement level in PH initiatives. • Number of local forums and workshops conducted. • Community participation rate. • Number of PH-focused health campaigns. • Public awareness level on health-planet links (survey-based). • Quality and accessibility of data provided. • Number of examples illustrating PH impacts shared in campaigns. • Number of green financing options promoted. • Awareness level on sustainable finance (survey-based). • Number of companies adopting ESG standards. • Increase in corporate participation in ESG reporting. • Number of companies with public ESG targets.

Shift 5: Sustainable Financing and Resourcing Planetary Health Development Initiatives

This shift focuses on transforming public understanding of planetary health through inclusive, values-based communication and education strategies that link daily actions to environmental and health outcomes. It leverages media, education systems, interfaith outreach and public dialogue to foster informed decision-making, promote green lifestyles and strengthen community ownership of sustainability efforts.

ENVIRONMENT and HEALTH: SYSTEMIC SHIFT 5

Strategies

To address the gap in understanding the connection between actions and planetary health (PH) boundaries, a robust communication strategy will be developed

Short Term (2027)

1. **Develop Diverse Communication Approaches**
   Use popular media—including talk shows, children's cartoons and online platforms—alongside "green desks" in media agencies and partnerships with social media influencers to broaden the reach of planetary health messages.
2. **Co-Design Research and Narratives**
   Collaborate with scientists, educators and media professionals to create accessible, engaging content on how environmental and human health are connected. Involve a broad range of stakeholders to ensure relevance.
3. **Host Annual Government Dialogues on Planetary Health**
   Create public platforms for communities to raise concerns and interact with government officials, experts and advocates. Use social media and fact-checking tools to promote transparency and public participation.
4. **Promote Green Lifestyle Choices**
   Encourage individuals to make environmentally friendly decisions in daily life—such as reducing waste, choosing sustainable products and using green services. Highlight the positive health benefits of sustainable behaviours and the risks of environmental damage.

Mid-Term(2030)

1. **Integrate Planetary Health into Education**
   Work with education ministries to embed planetary health into school and university curricula—covering sustainability, environmental and health impacts—and support this with annual PH Awareness Weeks and scholarships for advanced study in PH-related fields

Long-Term (2050)

1. **Engage Interfaith Groups in PH Outreach**
   Partner with religious communities to incorporate PH values into teachings, events and campaigns. Reinforce the idea that caring for the environment is a shared moral responsibility.

Lead Agencies	Impact tracking
MoC, MOHE, Ministry of Religious Affairs, State Ministries and Local Authorities, MOH, DOE, Bank Negara Malaysia, Bursa Malaysia	• Reach and engagement rate of campaigns. • Number of media channels used. • Number of PH-related modules introduced. • Participation rate in PH workshops and programmes. • Number of religious leaders engaged. • Community engagement level in PH initiatives. • Number of local forums and workshops conducted. • Community participation rate. • Number of PH-focused health campaigns. • Public awareness level on health-planet links (survey-based). • Quality and accessibility of data provided. • Number of examples illustrating PH impacts shared in campaigns. • Number of green financing options promoted. • Awareness level on sustainable finance (survey-based). • Number of companies adopting ESG standards. • Increase in corporate participation in ESG reporting. • Number of companies with public ESG targets.

Sustainable Food

The health of our global food system depends directly on the health of the planet. Environmental damage, global warming and increasingly severe climate-related disasters are putting food production and supply chains at risk. In the face of these challenges, principally climate change, biodiversity loss and declining soil health, we need to ensure that the food we grow and eat respects the Earth's limits and supports the well-being of both humans and the planet.

"Sustainable food" is food that is grown, processed and consumed in ways that are good for the environment, fair for society and economically viable. It nourishes people while also protecting and restoring the natural systems that make food production possible. Sustainable food production involves practices that protect soil, conserve water, reduce emissions and encourage biodiversity. This is different from conventional farming, which prioritises short-term profits and yields while causing long-term harm to the environment.

The environmental impact of food production is significant. Agriculture is responsible for approximately a quarter of global greenhouse gas emissions and is one of the main drivers of deforestation and habitat loss. Sustainable food systems use methods such as organic farming, agroecology and regenerative agriculture. These approaches cut down on chemical use, improve soil fertility and make farms more resilient to climate change. They also help to protect vital ecosystem services like clean water, pollination and carbon storage.

Food safety is also a key part of sustainable food. Many diets today are filled with unhealthy food, low in nutrients but high in sugar, salt, unhealthy fats and even cancer-causing compounds. These foods are linked to health problems such as obesity, diabetes, heart disease and cancer. Compounding the issue, unhealthy food is often cheaper and more readily available than healthier options such as organic foods and locally grown produce.

There are also serious concerns around pesticide use. Farmers exposed to pesticides face higher risks of cancer, neurological disorders, respiratory problems and reproductive issues. Pesticide residues in food pose significant health risks, especially for vulnerable groups like children and unborn babies. It is crucial to monitor pesticide levels in food and enforce strict safety rules to protect public health.

Sustainable food systems must also be socially and economically fair. This means ensuring good working conditions and fair pay for farmers and food workers, supporting local food economies and making healthy food available and affordable for all. In Malaysia, this means making sure that all Malaysians, regardless of income, can access a variety of safe, healthy and sustainable food.

Ultimately, building a truly sustainable food system is about more than protecting the environment. It is about protecting and improving human health, creating fair economic opportunities and making sure everyone has enough good food, now and in the future.

Challenges and Insights

Challenge 1: Unsustainable farming and weak policy enforcement

These two factors are major barriers to sustainable agriculture. Many farms still rely on outdated and harmful practices, including uncontrolled deforestation, improper land use planning and the overuse of pesticides. These methods damage the environment, pollute and threaten biodiversity. While Malaysia has policies such as the National Agrofood Policy and good practices like MyGAP that promote sustainable practices, enforcement is inconsistent. Weak coordination between federal and state authorities has allowed problems like illegal farming and pesticide overuse to persist. A study in Ecological Processes (Hidayat and Sugiarti, 2018) highlights that ineffective law enforcement contributes directly to these practices. Additionally, research (Wang et. Al. 2020) shows how agricultural land use causes "non-point source pollution"; widespread contamination that is hard to trace back to a single source, which further harms ecosystems.

Environmental damage is reducing productivity in the agriculture sector. In 2019, Malaysia's agriculture sector emitted nearly 10 million tonnes of CO_2 (UNFCCC, 2022). The biggest sources were:

- Nitrous oxide from fertilised soils (37.7 percent)
- Methane from rice paddies (22.9 percent)
- Emissions from livestock digestion (enteric fermentation, 12.3 percent)

Other contributors included burning crop waste, urea use and manure management. Although emissions were slightly lower than in 2005 (down 3.3 percent), this was due to a drop in livestock numbers and less fertiliser use, not the result of major policy or technology changes.

Food safety is an increasing concern in Malaysia. The widespread use of agricultural chemicals, particularly pesticides, has contributed to contamination in the food supply. More recently, microplastics have also been detected in food and water sources. These harmful exposures are linked to the rise in non-communicable diseases such as obesity and may even contribute to childhood stunting. A 2019 Ministry of Health study reported that nearly 30 percent of Malaysian children under five were stunted, with poor nutrition and unsafe food identified as key contributing factors.

Landscape Insight: Bridging Knowledge Gaps Between Agriculture, Food Systems and Planetary Health

There is a significant gap in public and institutional understanding of how sustainable agriculture, food security, food safety and planetary health are interconnected. This disconnect hampers the adoption of practices that could improve both environmental and human health outcomes.

Circular farming practices—such as composting organic waste, improve soil health, reduce chemical dependence and limit environmental contamination. These planetary health-aligned approaches also support stronger food safety protocols, helping to eliminate harmful residues from the food supply and build consumer trust in local production.

More sustainable agri-food systems directly improve public health outcomes. For example, enhanced food quality and dietary patterns can help address rising health concerns, such as obesity, which affected 19.7 percent of Malaysians in 2019.

Investing in sustainable agriculture protects the environment, eases healthcare burdens and boosts national food resilience.

Challenge 2: Labor-intensive techniques are due to small-scale farming operations, which lack the financial capability to invest in mechanisation and advanced technologies.

In 1957, agriculture was Malaysia's primary economic driver and relied heavily on manual labour. Over the years, however, the services and manufacturing sectors have overtaken agriculture in GDP contribution, driven by faster technological adaptation. In contrast the agriculture sector has been slow to modernise.

By 2023, agriculture accounted for just 7.8 percent of Malaysia's GDP. Of this, palm-oil contributed 3.7 percent, while other agriculture activities added only 1.7 percent. Notably about 84 percent of fertile agriculture land is used for commodity crops, while only 16.3 percent is allocated to food production (Figure 3-9).

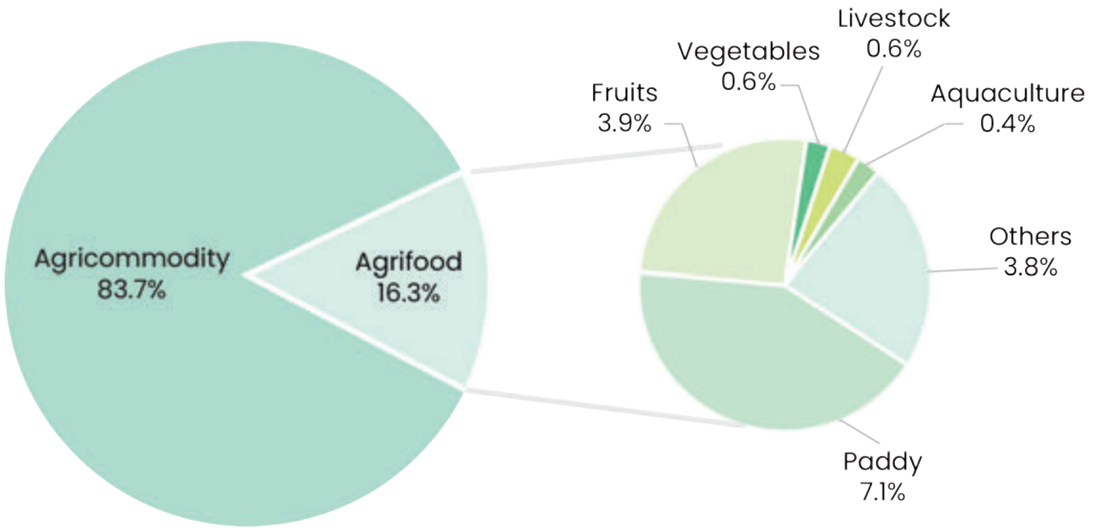


Figure 3-9: Agriculture Land Use by Subsector in 2021.
Data source from Malaysian Economy (2023), Chart obtained from Anis and Sharifulden (2024)

This imbalance, along with limited use of advanced technology and environmentally sustainable practices has led to several negative consequences. These include:

- Overuse of land, causing soil nutrient depletion.
- Greater reliance on chemical fertilisers to maintain yields.
- Soil degradation issues such as nutrient imbalance, acidification, biodiversity loss, contamination, erosion, salination, sealing, waterlogging and loss of organic carbon.

According to the Food and Agriculture Organisation (FAO, 2015), 33 percent of global land is already affected by soil degradation, In Malaysia, these impacts are threatening both agricultural productivity and the stability of food supply chains. Alarmingly, in 2022, the agricultural total factor productivity (TFP) for Malaysia lagged behind that of many ASEAN economies including Cambodia, Indonesia, Laos, Thailand and Vietnam (USDA, 2024).

The agriculture sector also faces serious demographic challenges. It struggles to attract young workers, as it is seen as low paid and unattractive. This perception has led to an ageing workforce, which further limits the sector's productivity.

Among Malaysia's 21 industrial sectors, agriculture is regarded as a "laggard sector" due to its low levels of innovation and knowledge content (Economic Planning Unit, 2016). This is primarily due to a weak agriculture innovation ecosystem, marked by poor technological infrastructure, a shortage of skilled technical talent, low investment in research and development (R&D) and fragmented governance. Consequently, Malaysia has been a net importer of food from 2011 to 2021, excluding palm oil from trade figures (Wong et al., 2024).

Ecosystem Insight: Advancing Agricultural Productivity Through Technology and Workforce Transformation

The adoption of advanced technologies—such as automation, drones, IoT sensors and AI has the potential to transform Malaysia's agricultural sector. These innovations can:

- Optimise resource use
- Improve crop monitoring
- Boost productivity
- Reduce dependence on manual labour

According to the Penang Institute, automation could replace up to 50 percent of agricultural tasks within the next 10–20 years, paving the way for more efficient and resilient farming systems.

However, modernisation also requires a strategic workforce transition. As technology use expands, there will be a growing need to:

- Reskill workers to operate and maintain new technologies
- Attract younger talent through improved wages, working conditions and technology-oriented career pathways

This transformation can help reverse the ageing workforce trend in agriculture and make the sector more dynamic and future-ready.

Challenge 3: Overreliance on Imports and a High Food Import Bill

Malaysia's food import bill reached RM 63 billion in 2022, highlighting the nation's limited agricultural productivity and its inability to meet domestic food demand (Dept of Statistics Malaysia, 2023). This heavy reliance on imports puts a strain on the economy and increases vulnerability to global food price fluctuations. The COVID-19 pandemic further disrupted global supply chains and drove food prices up by up to 20 percent (UNDP, 2023). Events such as India's 2022 export restrictions on rice and the ongoing Russia-Ukraine war further threatened food security, showing how urgently Malaysia needs to strengthen its agricultural resilience.

Malaysia's agricultural productivity remains low, limiting its competitiveness on the regional and global stages. While the country is a major producer of palm oil, it has struggled to diversify its agricultural exports, resulting in a persistent trade imbalance. The agriculture sector is a key pillar of Malaysia's economy, contributing 6.4 percent of GDP in 2023. Within the sector, oil palm stands out as the largest contributor accounting for 35.9 percent of agriculture output followed by other agriculture (29.6 percent), livestock (16.6 percent), fishing (11.5 percent), forestry and logging (4.8 percent) and rubber (1.7 percent) (Dept of Statistics Malaysia, 2024). This stagnation has contributed to a persistent food trade deficit, making it clear that bold reform and innovation in the agriculture sector are urgently needed.

Landscape Insight: Reducing Food Import Dependency Through Sustainable Agricultural Growth

Malaysia's food import bill reached RM 63 billion in 2022, highlighting its overreliance on imported food and exposure to global supply shocks. Enhancing agricultural productivity and adopting sustainable practices could significantly reduce this dependency.

In 2020, agriculture contributed only 7.1 percent to GDP, despite employing 10.7 percent of the labour force, a sign of low productivity and underutilised sector potential. By modernising the sector and increasing efficiency, Malaysia can:

- Raise local food output
- Strengthen food security
- Enhance export performance and agricultural GDP share
- Unlock growth in value-added agricultural products and green agri-tech innovations

This transition supports both economic resilience and planetary health objectives.

The Systemic Shifts for Sustainable Food

Malaysia's food system faces mounting pressures from climate change, biodiversity loss, and shifting consumption patterns, yet current approaches remain fragmented and short-term. This disjointed system undermines food security, nutrition, and ecological resilience. A systemic shift is needed to embed sustainability into every stage of the food chain, from production and distribution to consumption and waste management. The strategies outlined in this section aim to realign the food system with planetary health principles, ensuring safe, nutritious and affordable food for all while protecting ecosystems and supporting livelihoods.

Table 3-2: Sustainable Food – Current and Future States

Current State	Future State
Malaysia's agri-food sector remains dependent on manual labour, slow to adopt modern technologies and unattractive to younger workers. This has resulted in low productivity and limited innovation capacity across the value-chain.	The sector evolves into a knowledge-driven and technology-enabled ecosystem, integrating entire supply chains and supported by strong Science, Technology, Innovation and Economy (STIE) capacity. Advanced technologies, including precision and circular farming, are widely adopted, attracting a younger workforce and significantly improving productivity and innovation.
Current agricultural practices contribute to high levels of environmental degradation and pose risks to human, animal and ecosystem health. Contamination from pesticides, fertilisers and waste threatens biodiversity, contaminates ecosystems and weakens food safety.	Malaysia's future food system operates with strong environmental and food integrity safeguards. Ecosystem contamination is minimised through sustainable farming practices, ensuring both the resilience of natural systems and the safety of the food supply chain for consumers and producers alike.
Access to nutritious food remains uneven, particularly among vulnerable groups. This contributes to a growing burden of malnutrition, including stunting, obesity and diet-related non-communicable diseases.	A reformed governance system reverses environmental decline, restores ecological stability, improves quality of life and boosts the global competitiveness of Malaysia's economy
Due to low productivity and competition from more profitable agri-commodity sectors, Malaysia struggles to meet its domestic food demand. This has resulted in a high dependence on food imports and a persistent food trade imbalance.	The future agri-food sector is self-sufficient and regionally competitive. It meets national food requirements and supports a robust export market for high-quality, sustainably produced food—enhancing Malaysia's GDP and resilience in global food systems.

Five Systemic Shifts for Sustainable Food

To build a healthier and more sustainable future, five systemic shifts are proposed to tackle the five key challenges outlined earlier.

	1	2	3	4	5
	Strengthening the Governance and Management of the Nation's Natural Khazanah	**Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation**	**Planet-Friendly Businesses**	**Effective Communication, Behavioural and Values Mindset**	**Sustainable Financing and Resourcing Planetary Health Development**
FOCUS	Enhance governance, strategic planning and coordination to align with PH-friendly practices.	Invest in education, awareness, and human capital to build capacity for planetary health.	Encourage eco-friendly practices and reduce environmental impact.	Foster a values-driven and behaviourally aware society.	Secure funding and resources for planetary health.
CORE ELEMENTS	Reform institutional strategies at federal and state levels. Foster stonger collaboration across STIE (science, technology, innovation, economy). Promote sustainable management of natural assets.	Increase knowledge of sustainable agriculture and planetary health. Customise technology to fit cultural values and Indigenous practices. Develop culturally appropriate and acceptable innovations.	Transition subsidies from harmful to beneficial. Support CSR initiatives with clear sustainable goals. Implement measures to minimise the harmful use of chemicals in agriculture.	Develop integrated campaigns for responsible consumption. Educate and train farmers on new sustainable technology. Promote healthy eating habits using behavioural insights.	Introduce financial products for sustainable practices. Invest in local infrastructure and incentivise responsible consumption. Develop fiscal policies and subsidies to support green investments.

Figure 3-10: Five Systemic Shifts for Sustainable Food

Action Plans, Lead Agencies and Impact Tracking

Shift 1: Strengthening The Governance and Management of The Nation's Natural Khazanah

This shift focuses on transforming Malaysia's agrifood system through stronger multi-level coordination, realignment of subsidies and robust support for research, innovation and smallholder resilience. It aims to mainstream planetary health principles by promoting sustainable practices, enhancing food safety and integrating the agrifood sector into national STIE strategies and regional food security frameworks.

SUSTAINABLE FOOD: SYSTHEMIC SHIFT 1

Strategies
Improve Strategic Planning and Coordination Enhance collaboration across federal, state and local levels to align agrifood policies with STIE and planetary health goals. **Shift from Harmful to Beneficial Subsidies** Redirect subsidies to support sustainable farming systems and green technologies. **Strengthen the PH RDICE Ecosystem** Build partnerships with public research institutes and universities to promote innovation, talent development and infrastructure for sustainable food systems.
Short Term (2027)
1. **Establish a High-Level Panel** Create a multi-stakeholder panel to develop an integrated master plan for a sustainable, STIE-driven agrifood sector. **2. Create a One-Stop Training Hub** Set up a central hub to train policymakers, businesses and communities on sustainable agrifood practices, SDGs and ESG compliance. **3. Support Small and Indigenous Farmers** Provide hands-on technical and financial support to help smallholders and rural communities transition to sustainable farming. **4. Strengthen Food Safety and Integrity** Improve systems to prevent contamination from hazardous chemicals and microplastics. **5. Expand Access to Green Finance** Provide financial products that support sustainable agriculture and ESG compliance. **6. Encourage Innovation through Competitions** Organise innovation competitions to fund and scale sustainable agritech solutions. **7. Use the Malaysia Science Endowment (MSE)** Use the MSE to fund R&D in sustainable food production with strong links to health and ecological outcomes.
Mid-Term(2030)
1. Protect Agricultural Land and Water Resources Gazette fertile land and key water bodies for sustainable food production using PH-friendly methods. **2. Strengthen Sustainable Extension Services** Enhance the reach and quality of extension programmes to spread PH-aligned knowledge and technologies. **3. Improve Enforcement and Incentives** Strengthen regulations and offer fiscal incentives to promote compliance with PH standards.
Long-Term (2050)
1. Establish a Green Corridor Create a tech-enabled logistics and resource-sharing network to connect food supply chains across Peninsular and East Malaysia. **2. Integrate with the ASEAN Food Grid** Position Malaysia within a regional food security system by strengthening national capacity and negotiating regional frameworks. **3. Strengthen the RDICE Ecosystem for Long-Term Impact.** Secure sustained funding, expand infrastructure and develop talent to support advanced food systems that meet PH and ESG standards. This will drive innovation and long-term sustainability in agriculture. **4. Implement Fiscal Policies for Sustainability** Introduce tax breaks, grants and low-interest loans to encourage the adoption of sustainable agricultural practices.

Lead Agencies	Impact tracking
MAFS, NRES, KPDN, MOH, Jabatan Digital Negara, JAKIM	• Compliance rates to sustainable agrifood systems practices and food safety standards. • Frequency and coverage of inspections and audits and Level of stakeholder awareness and engagement. • Incidences of food contamination due to chemical pollution and microplastics. • Adoption level of PH and ESG best practices.

Shift 2: Nurturing People to Lead a Healthy, Prosperous and Values-Driven Nation

This shift focuses on raising awareness of the links between sustainable agriculture, food security and planetary health, while ensuring that agricultural technologies are adapted to local cultures and Indigenous knowledge. It promotes context-sensitive innovation by integrating traditional practices with modern approaches to build resilient, inclusive and sustainable food systems.

SUSTAINABLE FOOD: SYSTHEMIC SHIFT 2

Strategies	
Promote Understanding of Sustainable Agriculture and Planetary Health Raise awareness and align perceptions of how sustainable farming, food security, food safety and planetary health are interconnected. **Adopt and Adapt Technology to Fit Cultural and Indigenous Contexts** Ensure agricultural technology respects cultural norms and integrates indigenous knowledge for sustainability.	
Short Term (2027)	
1. Assess Existing Technologies: Evaluate current agricultural technologies to understand their suitability for different cultural settings and impact on indigenous practices.	
Mid-Term(2030)	
1. Develop Culturally Appropriate Technologies: Work with research institutions and indigenous communities to design context-sensitive and sustainable tools.	
Long-Term (2050)	
1. Integrate Indigenous and Modern Practices: Create systems that combine indigenous wisdom with modern technologies to achieve innovative, sustainable outcomes.	
Lead Agencies	**Impact tracking**
MAFS, MITI, MOF, ME, MSME, Industry Associations and Business Chambers, Consumer Association	• Number of PH educational programs, workshops, seminars and awareness campaigns targeted at different stakeholders, including farmers, producers, consumers and policymakers. • Number of case studies and success stories that demonstrate the positive impact of the awareness and education strategies. • Number of successful collaborations among industry, GLCs, government agencies, universities and research institutions.

Shift 3: Planet-Friendly Businesses

This shift focuses on supporting farmers and agrifood businesses to adopt planetary health-aligned practices through targeted training, incentives and one-stop support services. It also aims to reduce harmful chemical use, scale up organic alternatives and embed sustainability into corporate social responsibility policies across the sector.

SUSTAINABLE FOOD: SYSTHEMIC SHIFT 3

Strategies
Transition to Planetary Health-Friendly Practices: Help farmers and businesses adopt sustainable practices through targeted support, training and access to resources. **Prevent Overuse of Chemicals in Agrifood Systems** Reduce excessive use of pesticides, antibiotics and chemical fertilisers by enforcing guidelines and promoting safer alternatives. **Promote Corporate Social Responsibility (CSR)** Encourage businesses to adopt CSR policies aligned with planetary health and sustainability goals.
Short Term (2027)
1. **Awareness Initiatives:** Increase understanding of government incentives that promote PH-friendly technologies. 2. **Hand-Holding Support:** Create partnerships to guide SMEs and farmers step-by-step through the transition. 3. **Capability Building:** Strengthen SME innovation capacity by improving access to skills training and technology. 4. **Cost- Sharing Programs:** Encourage group investments in green technologies to reduce costs for smallholders. 5. **One-Stop Support Centres:** Set up dedicated centres offering advice and resources for PH and ESG compliance.
Mid-Term(2030)
1. **Reduce Harmful Chemical Use:** Limit excessive and unnecessary use of pesticides, antibiotics and chemical fertilisers. 2. **Increase Funding for R&D in Organic Food Products:** Invest in research to reduce the cost of producing organic crops and livestock, making them more affordable and appealing to farmers. 3. **Awareness Campaigns:** Educate stakeholders on the health risks of chemicals and the benefits of organic and integrated pest management alternatives.
Long-Term (2050)
1. **CSR Policy Development:** Establish sustainability goals, integrate PH into operations, train staff and assess performance regularly.

Lead Agencies	Impact tracking
MAFS, NRES, MOH, MOSTI, MOHE, MOE, Security Commission, BURSA Malaysia	• Number of PH educational programs, workshops, seminars and awareness campaigns targeted at different stakeholders, including farmers, producers, consumers and policymakers. • Number of case studies and success stories that demonstrate the positive impact of the awareness and education strategies. • Number of successful collaborations among industry, GLCs, government agencies, universities and research institutions.

Shift 4: Effective Communication, Behavioural and Values Mindset

This shift focuses on empowering smallholder farmers with access to new technologies, training and digital infrastructure, while promoting responsible food choices and healthier lifestyles. It uses behavioural insights, community engagement and targeted campaigns to drive shifts in farming practices and consumer habits that align with planetary health and national dietary goals.

SUSTAINABLE FOOD: SYSTHEMIC SHIFT 4

Strategies	
Increase awareness, knowledge and use of new technologies among small holder farmers. Promote responsible food choices and healthy lifestyles.	
Short Term (2027)	
1. Enhance Extension Programmes: Train farmers to use and maintain new technologies with better extension services and technical support. **2. Strengthen Role of Community Leaders:** Involve community leaders to help shift farmer attitudes and encourage new practices. **3. Set Up Pilot Projects and Demo Farms:** Showcase technology benefits through real-life examples; involve youth in modern farming. **4. Develop Campaign Strategies:** Create integrated campaigns to promote healthy eating and sustainable habits based on the Malaysian Dietary Guidelines. **5. Use Behavioural Insights:** Encourage lifestyle changes that support both personal health and the environment.	
Mid-Term(2030)	
1. Invest in Reliable Internet Access: Improve internet in rural areas to support digital tools and communication. 2. **Encourage cost-sharing programs -** Help farmers jointly invest in technology to reduce individual costs.	
Lead Agencies	**Impact tracking**
MAFS, NRES, KPDN, MOH, Jabatan Digital Negara	• **Percentage of farms complying with updated national pesticide guidelines**, including mandatory pre-harvest intervals and participation in certified farmer training programmes. • **Number of inspections and enforcement actions conducted** annually to monitor compliance with the Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR). • **Proportion of farms adopting alternative pest and antibiotic control methods,** such as integrated pest management and organic practices. • **Annual government funding allocated to R&D** for reducing the cost of organic crop and livestock production. • **Number of public awareness programmes implemented** on antimicrobial resistance (AMR) and the risks of chemical pesticide and fertiliser use. • **Reach and engagement metrics** (e.g. participants, media impressions) for campaigns promoting organic farming and sustainable agricultural practices.

Shift 5: Sustainable Financing and Resourcing Planetary Health Development Initiatives

This shift focuses on leveraging market and financial incentives to accelerate the adoption of sustainable agrifood practices, especially among smallholders and agribusinesses. It promotes access to tailored financing, insurance and infrastructure while embedding planetary health goals into corporate strategies, pricing policies and CSR initiatives to ensure long-term impact.

SUSTAINABLE FOOD: SYSTHEMIC SHIFT 5

Strategies	
Use market and financial incentives to support sustainable change. Develop and Expand Access to Finance for Sustainable Agrifood Systems.	
Short Term (2027)	
1. Design tailored financial products: Develop and promote financing and insurance options that are aligned with planetary health (PH) goals, specifically for sustainable agrifood systems. **2. Improve financial access:** Ensure small-scale producers and agribusinesses can access capital to adopt and maintain sustainable practices.	
Mid-Term(2030)	
1. Expand infrastructure and networks: Build local systems that improve access to affordable, healthy food. **2. Encourage healthy food pricing:** Support initiatives where food retailers offer discounts on nutritious food to encourage healthier choices. **3. Develop a Clear Policy on Sustainability and Planetary Health:** Create strong business policies that embed planetary health (PH) goals into daily operations and long-term strategies. **4. Develop clear CSR policy:** Help agribusinesses integrate sustainability and PH goals into their daily operations. **5. Train employees:** Provide staff training to build understanding and support for CSR and sustainability efforts.	
Lead Agencies	**Impact tracking**
MAFS, KE, MOF, NRES, BURSA Malaysia, MOSTI, MGTC, Agrobank and other financial institution	• Number of GLCs involved and quantum of the amount financed and technology adapted. • Amount of investment flowing into sustainable food production projects. • Number of carbon credit transactions generated from sustainable agriculture practices and volume of credits issued. • Number of farmers and agribusinesses that have gained access to new financial products and services. • Financial returns from investments in sustainable food production; Number of new insurance products.

Research and Education

Malaysia's future depends on using science, technology and innovation to protect the country and, by extension, the planet, while also valuing nature-based solutions and traditional knowledge. Indigenous communities hold deep knowledge of foods, medicines, habitats, forest products and sustainable living, which must be preserved and integrated into research, education and people's daily lives.

Malaysia has a robust education system across primary, secondary and higher levels. It also has a vibrant network of technical and vocational education and training (TVET) institutions and other professional development providers. As noted earlier in this Plan, surveys show that businesses are aware of planetary health issues, but few are taking concrete steps toward planet-friendly practices (Appendix 1). Similarly, public awareness exists, but many people do not know how they can play a role in addressing these concerns (Appendix 2).

To shape a more planet-friendly future, Malaysia's education system must play its part in preparing a new generation of changemakers. This means:

- Shifting from fragmented coordination to collaborative partnerships that build a strong pro-planet education and training ecosystem.
- Equipping learners with the values and skills to care for both people and the environment and to advocate, communicate, manage and promote planet-friendly practices.
- Systematically sharing more learning, knowledge and resources across government, businesses and non-governmental and civil organisations to accelerate impact.

Ambitious plans such as the National Energy Transition Roadmap require a shift in educational values and approaches at all levels. Malaysia needs leaders and workers who are not only skilled and knowledgeable but also guided by a keen sense of environmental responsibility and ethical awareness. These individuals must be able to:

- Apply planet-friendly practices in their daily lives.
- Guide their organisations to adopt sustainable operations and supply chains.
- Communicate and encourage behaviour change towards sustainability.
- Work with others to create innovative funding models for circular and green economies.
- Foster public champions to raise awareness and drive collective action to reduce environmental impact.

The success of Malaysia's planetary health transition depends not only on infrastructure and policy, but also on leadership capable of navigating complex, interconnected challenges. To support this, the NPHAP proposes the rapid development and implementation of a Transformational Sustainability Leadership Module tailored for public servants, industry professionals, civil society leaders and youth representatives. This training initiative will be designed around core planetary health competencies and future-facing themes such as systems thinking, values-based leadership, ethical decision-making and adaptive governance. It aims to cultivate leaders who can balance ecological integrity with economic development and who are equipped to lead behavioural and institutional transformation.
Appendix 5 outlines the proposed thematic focus areas:

- Systems leadership and policy integration
- Planetary health science and risk-informed decision-making
- Regenerative business models and inclusive innovation
- Ethical foresight and intergenerational responsibility
- Strategic communication and narrative framing for behavioural change

The module will be integrated into national training institutions such as Institut Tadbiran Awam Negara (INTAN), TalentCorp and relevant sectoral academies. Over time, it will become a core offering within Malaysia's public sector and professional development ecosystem, laying the foundation for a values-driven, future-ready leadership culture across the nation.

Challenges and Insights

Malaysia faces five key challenges to advancing planetary health, particularly in education, training and research.

Challenge 1: Fragmentation Across the Education and Training Ecosystem

Malaysia's education and training ecosystem is supported by a wide range of ministries and agencies. Access is high across most levels. Preschool participation is nearly universal and over a million students are enrolled in higher education.

However, the system is fragmented. Early childhood education alone is delivered by multiple agencies, while primary, secondary, TVET and higher education fall under separate authorities. Workforce training and professional development are overseen by yet another ministry, with numerous agencies offering short courses and skills development programmes. This fragmentation leads to weak coordination, overlapping policies, duplicated programmes and inefficient use of resources. Collaboration across institutions, sectors and ministries remains limited, hindering efforts to build coherence, scale up impactful practices or drive meaningful reform Siloed innovation and future-oriented initiatives prevent the system from preparing a workforce capable of supporting a sustainable, resilient future. Interaction along the broader education and training value chain is also minimal, leaving few opportunities for knowledge-sharing, peer learning, or coordinated action towards shared national goals.

A more integrated and future-ready education system requires stronger inter-agency cooperation, alignment of policies and resources and a clear strategy to embed sustainability and planetary health principles across all levels of education and training. This includes reforming curricula, incentivising cross-sector collaboration and investing in systems that nurture lifelong learning for both individuals and organisations.

Research and development must also be strengthened, particularly in environmental science, public health and sustainable development. Enhanced research capacity would provide deeper insights into the interconnections between human health and ecosystems and inform solutions to critical challenges such as climate change, air and water quality and food security.

Landscape Insight: Structure and Reach of Malaysia's Education System

Malaysia's education system is structured into five sectors under the Education Act 1966 (Act 550): early childhood, primary, secondary, post-secondary and tertiary education. These sectors are overseen by four main ministries: the Ministry of Education (MOE), the Ministry of Rural and Regional Development (MRRD), the Ministry of Higher Education (MOHE) and the Ministry of Human Resources (KESUMA), with each playing distinct roles.

- Early Childhood Education is not mandatory, yet 98 percent of children attend preschool. In 2021, Malaysia had over 27,500 preschools:
  - 59 percent run by MOE and MRRD
  - 36 percent privately operated
  - 11 percent managed by JPNIN (Ministry of National Unity)
- Primary and Secondary Education are led by MOE. Six years of primary education are compulsory for Malaysian citizens aged 6 to 12. In 2023, MOE oversaw:
  - 6,294 preschools
  - 7,779 primary schools
  - 2,452 secondary schools
  - 412,684 teachers and 4.8 million students
  - MRRD operates 57 Science Junior Colleges with a 10 percent acceptance rate.
  - The private sector runs 187 secondary schools and 223 combined-level institutions.
- Tertiary Education, under MOHE, includes 20 public universities, 387 private institutions, 36 polytechnics and 105 community colleges, serving over 1.24 million students as of 2023.
- Agencies operating under KESUMA include the Human Resources Development Corporation (HRDCorp), Talent Corporation Malaysia Berhad (TalentCorp), the National Institute of Occupational Safety and Health (NIOSH), the Social Security Organisation (Pertubuhan Keselamatan Sosial or PERKESO) and the Skills Development Fund Corporation (Perbadanan Tabung Pembangunan Kemahiran or PTPK).

Challenge 2: Fragmented Planetary Health Literacy:

Understanding planetary health means recognising the deep connections between human well-being and the natural systems we live in (Jochem et al., 2023). When individuals and communities are planetary health conscious and literate, they can see their health as part of a broader environmental context and become more aware of how their actions affect themselves, their communities and the planet.

Planetary health literacy involves the ability to make informed decisions that benefit both human and environmental health, from the individual to the global level. It requires developing the skills to access, interpret and apply information on environmental and health issues. A clear understanding of how lifestyle choices and daily activities affect both human wellbeing and ecosystem integrity is central to this literacy. It also includes knowledge of systems thinking, enabling individuals to see connections across sectors and understand how different outcomes are interlinked. Planetary health literacy values both scientific knowledge and traditional wisdom, including indigenous insights, and promotes a mindset of lifelong learning, with education continuing across all stages of life.
Experts have outlined eight learning objectives for planetary health (Jacobsen et al., 2024):

1. Understanding Earth system changes
2. Recognising the links between ecological systems and health outcomes
3. Assessing environmental and health risks
4. Understanding governance structures and policy and planning implications
5. Engaging in individual and collective action
6. Exploring ethical dimensions of planetary health
7. Communicating effectively about planetary health and sustainability.

Planetary health is not taught as a single subject in the current curriculum but is instead scattered across different disciplines. .

- At the primary and secondary school levels, planetary health elements are included in science, technology, engineering and mathematics (STEM) and in general subjects like language, history and moral or religious education.
- At the upper secondary level, subjects such as geography—which cover earth system changes and ecological dynamics—are available, but only as electives rather than core requirements.
- At the higher education level, the National Education Code (NEC) (MoHE Malaysia, 2020), introduced by the Ministry of Higher Education (MOHE) in 2020, outlines ten broad fields of study. While it encourages some integration across disciplines in programme and curriculum development, the structuring of knowledge remains compartmentalised.

Critics argue that the curriculum at primary and secondary levels and the framing of sustainability exclude indigenous and faith based perspectives (Dzulkifli,, 2021), particularly from the Asia Pacific, where most of the world's population lives. Many belief systems in the region strongly advocate respect for nature and all living things. The concept of the "three Ps"—Planet (ecological component), Prosperity (economic systems) and People (socio-cultural aspects of humankind)—is seen as interdependent, guided by values that support harmony between humans and the environment.

The absence of a coherent, cross-cutting educational framework, combined with limited integration of local cultural and Indigenous knowledge, reduces the capacity of individuals and communities to fully understand the interdependence of human and planetary well-being. Current approaches often remain confined to isolated curriculum components and siloed knowledge streams, failing to reflect the complexity of the challenges we face.

To cultivate a planetary health-literate society, Malaysia must embrace more interdisciplinary and contextually grounded learning. This requires embedding systems thinking, ethical reasoning, cultural relevance and a commitment to lifelong learning across all educational pathways, from early childhood through to tertiary, vocational and adult education.

Such an approach is not only essential for developing informed and responsible citizens, but also for equipping future generations with the values, skills and leadership required to shape a just, sustainable and resilient future.

Ecosystem Insight: Sejahtera – A Guiding Philosophy in Malaysian Education

In Malaysia, sejahtera is more than a word—it represents a national aspiration for holistic well-being. Introduced in 1988 through the National Philosophy of Education (Falsafah Pendidikan Kebangsaan), sejahtera serves as a foundational concept for balanced and sustainable living.

The philosophy emphasises a progressive journey towards quality of life through:

- The development of well-rounded individuals.
- Balancing intellectual, emotional, spiritual and physical well-being grounded in personal and cultural values and faith.
- Cultivating citizens who are knowledgeable, ethical and responsible.
- Empowering individuals to contribute meaningfully to their families, community and society.

Rooted in cultural values and national identity, sejahtera continues to shape education, leadership and development discourse in Malaysia.

The table below highlights a selection of existing programmes related to planetary health training in Malaysia. While these initiatives show promise, especially in environmental science, they are still fragmented and lack coordination. Crucially, there is no national certification to recognise planetary health skills or knowledge.

There is an urgent need to develop dedicated academic programmes that embed planetary health principles, as well as integrate these concepts throughout all levels of formal and non-formal education. Equally important is the design of targeted upskilling initiatives for policymakers, alongside the development of nationally accredited short courses tailored to local cultures and accessible to communities and the wider public. These interventions are foster shared understanding, enhance institutional capacity and enable diverse stakeholders to play an active role in advancing Malaysia's planetary health agenda.

Table 3-3: Training Activities related to Planetary Health (Malaysia)

Type of Training	Provider	Key Features/Limitations
Formal Academic Programmes at IHLs	• MSc in Environmental Health (UM) • MSc/PhD in in Environmental and Health (USM) • Bachelor in Environmental Science (UKM) • Diploma in Environmental Management (UiTM) • Graduate Certificate in Planetary Health (UM)	• Focus more on environmental/public health • Limited explicit "planetary health" branding • Not universally integrated
Professional Short Courses	• Workshops on climate-resilient healthcare (MoH) • Biodiversity/ESG compliance training (DOE) • Biodiversity conservation and community health (WWF Malaysia)	• Targeted audience such as healthcare workers • Technical focus and limited planetary health framing • Emphasis more on policy compliance • Strong community focus • Funding dependent
Civil Service Training	• Environmental governance modules (INTAN) • Climate adaptation for health directors (MoH)	* Directed to top government officials * Policy/management focus
Community/Citizen Programmes (NGO-Led)	• Youth climate advocacy training (Klima Action Malaysia [KAMY]) • Zero Waste Malaysia: Community recycling workshops	* Focuses on grassroots * Action-oriented * Localised content
Corporate Training (large corporations and MNCs such as Sime Darby, PETRONAS, Nestle Malaysia, Loreal	Internal ESG workshops	* Targets corporate employees * Focuses on carbon footprint, waste reduction * Rarely links to human health outcomes

* *List is not exhaustive*

Challenge 3: Key Groups Left Out of Planetary Health Literacy Efforts

The knowledge gap around planetary health extends into two of Malaysia's most influential stakeholder groups—its civil service and business community.

As of 2023, Malaysia's civil service employed just over 1.4 million civil servants[1] . Despite their key role in policy formulation and implementation, foundational knowledge of planetary health remains largely absent from civil service training. The National Institute of Public Administration (Institut Tadbiran Awam Negara or INTAN) manages the Public Service E-Learning portal[2] *(E-Pembelajaran Sektor Awam or EPSA)*, offering just under 300 courses across 32 categories, but none cover planetary health. This gap is significant given the civil service's potential to model planet-friendly behaviours, such as phasing out single use plastics in all public events and operations. Their example could help drive wider societal change across sectors.

The business landscape shows similar gaps. In 2022, a total of 1.43 million local businesses were registered[3] under the Securities Commission Malaysia (*Suruhanjaya Sekuriti Malaysia* or SSM), of which 97.4 percent were micro or MSMEs. The top three sectors were services (83.8 percent), construction (8 percent) and manufacturing (5.8 percent).

While awareness of planetary health is high among multinational corporations (MNCs) and GLCs, it remains low among MSMEs, which are largely focused on their immediate supply chains. Many cite cost concerns and unfamiliarity with the concept as key barriers to change. Survey findings (n=2,099), conducted in the first half of 2024, revealed that awareness and commitment vary significantly by firm size, sector and location. Respondents noted that the concept is poorly communicated through mass media, further limiting understanding.

Addressing these knowledge gaps—particularly within the civil service and MSME sectors—is critical. Without targeted and inclusive literacy strategies, Malaysia's ambitions for a nature-positive and sustainable economy risk being undermined by weak implementation and limited buy-in from those most capable of driving change.

Ecosystem Insight: Gaps in Planetary Health Readiness

Civil Service:

- 1.44 million civil servants, of whom 60 percent are women and 10 percent are under the age of 30
- 68 percent are employed in the Ministry of Education (MOE), Ministry of Health (MOH), or Ministry of Higher Education (MOHE)

INTAN's e-learning platform hosts nearly 300 courses, yet none address planetary health

Business Sector:

- 1.43 million registered businesses, 97.4 percent of which are micro, small, or medium-sized enterprises (MSMEs)
- Sector is dominated by services (83.8 percent), with a growing presence in technology
- Planetary health training remains largely absent across the private sector

Takeaway:

Key institutional actors currently lack structured exposure to planetary health, limiting their capacity to lead by example or drive systemic change.

[1] Statistics extracted from Sistem Ydata @IYRES
[2] Portal accessible through the following: E-Pembelajaran Sektor Awam (epsa.gov.my)
[3] Statistics extracted from in-house reports developed by the Academy of Sciences Malaysia on Malaysia's talent landscape (2023) and RDICE ecosystem roadmap (2023)

Challenge 4: Significant Gaps Hinder Research Progress:

Malaysia's national innovation system is maturing, with steady progress in building R&D capacity. In 2020, gross domestic expenditure on R&D (GERD) stood at RM 13.5 billion, just 0.95[1] percent of GDP. Universities accounted for the largest share (47.3 percent) in 2020 followed by business enterprises (34.2 percent), government research institutes (18.7 percent) and non-governmental organisations (0.1 percent). The number of researchers per 10,000 labour force stood at 33.

Despite increased public investment, innovation performance has stagnated. The country slipped from 31st [out of 125] in the 2011 Global Innovation Index (GII) to 36th (out of 132) in 2022. Much of the R&D funding lacks continuity and has not translated into measurable social and environmental impact.

Fragmentation across ministries and agencies, coupled with a disconnect between research (R), development (D), commercialisation (C) and innovation (I), limits Malaysia's ability to harness the full potential of STI. These components remain siloed rather than operating as an integrated RDICE (Research-Development-Innovation-Commercialisation-Economy) ecosystem. Strengthening linkages across this chain is vital to elevate Malaysia's global STI standing.[2]

Despite being in one of the world's most biodiverse regions, Malaysia has yet to position itself as a leader in planetary health research. Efforts remain scattered and poorly aligned with national priorities, global challenges or industry needs. University and government research outputs often remain disconnected from real world applications due to weak cross-sector communication and collaboration.

Many researchers struggle to translate findings into accessible, actionable knowledge for industry, policymakers, or the public. As a result, businesses often import solutions rather than invest in domestic R&D capabilities.[3] Grassroots and indigenous innovations are seldom recognised or scaled up, due to inadequate support structures.

Direct funding for planetary health research remains limited. Without sustained investment, enabling policies and stronger platforms for knowledge exchange Malaysia risks missing the opportunity to develop locally driven, planet-positive solutions. A robust, coordinated and impact-oriented STI ecosystem is essential for a sustainable future.[4]

To address the shortfall in public investment, greater participation from non-government actors is essential. Mobilising resources, expertise and diverse perspectives—including Indigenous knowledge[5] —will be critical to strengthening education, training and research systems. Engaging civil society, the private sector, philanthropic organisations and local communities can help bridge funding gaps, foster innovation and ensure solutions are contextually relevant and inclusive.

Ecosystem Insight: Six Key Challenges in Malaysia's STIE Ecosystem

A review of national STIE policies and strategies reveals persistent structural and institutional gaps:

1. MSMEs (which make up 97.4 percent of firms) contributed only 37.4 percent to GDP and 11.7 percent to exports in 2021.
2. 79 percent of research personnel are based in academia; just 15.8 percent are based in industry—limiting research–business collaboration.
3. Only 22.8 percent of firms reported having made innovation investments (National Innovation Survey 2021).
4. In 2022, just 100 companies accessed R&D tax incentives (worth RM14 billion).
5. Research priorities across ministries are often misaligned and public funding is unevenly distributed.
6. Weak policy signals and unclear targets continue to deter sustained private sector investment in research, commercialisation, development and innovation (RCDI).

The 10-10 MySTIE Framework was introduced to address these barriers—integrating STI with socio-economic drivers to boost competitiveness and enable inclusive, sustainable development by 2030.

[1] Statistics available at the Malaysian Science and Technology Information Centre (MASTIC) portal, accessible at the following: Malaysian Science, Technology Information Centre (MASTIC) (mosti.gov.my)
[2] Analysis derived from in-house report on RDICE ecosystem roadmap (2023) developed by the Academy of Sciences Malaysia)
[3] Input synthesised from focus group discussions conducted by ASM between January to March 2024
[4] Input synthesised from focus group discussions conducted by ASM between January to March 2024
[5] Input synthesised from focus group discussions conducted by ASM between January to March 2024

Challenge 5: Public Consciousness and Understanding on the Planetary Health Issues.

Public awareness of planetary health issues in Malaysia is growing but remains fragmented and inconsistent, with pockets of high awareness alongside significant gaps in understanding and action. For example, while many recognise the health impacts of air pollution and haze, few understand their links to long-term climate change. Similarly, plastic waste is widely acknowledged due to media campaigns and policy measures (e.g. plastic bag charges), yet consumption remains high—highlighting an attitude–behaviour gap.

Surveys show that although many express concerns, adopting sustainable lifestyles remains a challenge. Economic pressures often take priority over long-term environmental concerns. Awareness is generally higher in urban areas with better access to information, while rural communities—despite greater dependence on natural resources—have less exposure to broader planetary health discourse. Understanding of the connections between deforestation, climate change, zoonotic disease, food security and health remains low and navigating credible information amid misinformation and greenwashing is a persistent challenge.

Case Studies

Global Impact, Local Action: How MNCs Are Advancing Planetary Health in Malaysia

1. **Project SPOTS (Loreal Malaysia)**

   The L'Oréal Malaysia SPOTS (Sustainable Palm Oil and Traceability with Sabah small producers) Project aimed to support small-scale palm oil farmers in Beluran, Malaysia by promoting traceability and Roundtable on Sustainable Palm Oil (RSPO) certification to meet the market demand for "Zero Deforestation" palm oil.

   Launched in 2015, it targeted 500 smallholders by the end of 2020. A total of 225 training sessions were conducted alongside small palm producers to provide them with knowledge about the RSPO certification system, including best management and sustainable agricultural practices, waste management and soil health.

   Since then, 21,357 metric tons of RSPO certified palm oil have been generated by the 369 beneficiaries of the project. By the end of 2018, 369 small independent farmers had joined the SPOTS project and 179 obtained the RSPO certification (representing 73 percent of the target) and were delivering directly to Wilmar (Asia's leading agribusiness group).

2. **Mangrove Conservation Program (Yayasan Sime Darby)**

   Yayasan Sime Darby collaborates with the Global Environmental Centre (GEC) for a community-based mangrove conservation and sustainable livelihood programme at Kuala Gula, Kerian and Sitiawan, Manjung, Perak. The programme promotes the participation of underprivileged communities in the rehabilitation and protection of degraded mangrove forest areas by planting mangrove saplings, establishing nurseries, monitoring and patrolling the nurseries as well as the planting sites. The programme helped to empower the communities with means to generate income from alternative sources such as eco-tourism and non-timber forest products.

Case Studies

Shaping Sustainable Futures: Planetary Health Leadership in Malaysian Higher Education

1. **University of Malaya Zero-Waste Campaign (UM ZWC)**

   The UM ZWC, one of the university's longest and most consistent sustainability living labs, was set up to spearhead the development of a sustainable waste management model in UM and ultimately achieve zero-waste status. UM ZWC contributes to the university's Low Carbon City Framework (LCCF) targets while providing research opportunities and platforms for teaching and learning. It also enables staff and students to enhance their soft and entrepreneurial skills. Subsequently, UM ZWC has expanded to assist several local communities in developing sustainable waste management systems, including communal composting projects through various collaborations and partnerships.

2. **USM MARA-STEMGREENRECH Programme (Universiti Sains Malaysia)**

   The MARA-STEMGREENRECH Programme focuses on STEM and green technology for educators and students at MARA Junior Science Colleges (MRSM) across Malaysia. It aims to enhance teachers' capacity in areas such as Microbial Fuel Cells and Antimicrobial Resistance, in alignment with SDG 4 (Quality Education). Through these initiatives, educators are equipped with innovative teaching skills, which not only benefit students but also uplift communities by promoting environmental awareness and contributing to sustainable livelihoods.

3. **University College Sedaya International (UCSI) GREEN MARKET Programme**

   The Green Market is a signature annual initiative at UCSI University, dedicated to promoting environmental awareness and sustainable living among students and young people. Featuring a wide range of booths and activities, including green plant stalls, recycling charity drives and environmental education showcases, the programme serves as an interactive platform for learning about sustainability, waste reduction and nature-based solutions such as home planting and upcycling.

The Systemic Shifts for Research and Education

Malaysia's research and education systems are not yet fully geared to meet the urgency and complexity of planetary health challenges. Knowledge remains fragmented, investment is limited, and curricula often fail to prepare future generations for integrated, sustainability-driven problem-solving. A systemic shift is required to embed planetary health across research priorities and educational pathways, fostering innovation, transdisciplinary collaboration and evidence-based policymaking. The strategies outlined here will build the capacity, skills and knowledge base needed to drive long-term resilience and sustainable development.

Table 3-4: Research and Education - Current and Future States

Current State	Future State
Commitment levels on the responsibility for the planet vary widely. Many stakeholders, including individuals and institutions, face constraints in capacity and capability to create impactful change.	A shift towards coalitions of like-minded individuals and organisations committed to collaborative, systems-wide change across all levels of society.
Education and training systems operate in silos, limiting integrated and effective learning outcomes	Individuals are empowered with the knowledge and awareness to practice and lead planet-friendly changes in daily life, organisations and broader systems. Systems level thinking is embedded in planetary health education, supporting understanding of the links among human health, environmental systems and socio-economic factors.
The research ecosystem suffers from breakdowns in the RDICE (Research, Development, Commercialisation, Innovation and Economy) value chain due to lack of coordination, limited funding and insufficient capacity building, especially in public advocacy and science communication.	Research and innovation ecosystems are better coordinated and sustainably funded, fostering cross-sector collaboration, improved public engagement and stronger communication of green economic models. Sustained public and private investment ensures a continuous pipeline of science-based, context-relevant solutions to planetary health challenges.

Five Systemic Shifts for Research and Education

Towards a healthier and more sustainable future, five systemic shifts are recommended to address the give challenges documented in the earlier section.

	1	2	3	4	5
	Strengthening the Governance and Management of the Nation's Natural Khazanah	**Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation**	**Planet-Friendly Businesses**	**Effective Communication, Behavioural and Values Mindset**	**Sustainable Financing and Resourcing Planetary Health Development**
FOCUS	Enhance governance, strategic planning and coordination to align with PH-friendly practices.	Encourage eco-friendly practices and reduce environmental impact.	Foster a values-driven and behaviourally aware society.	Foster a values-driven and behaviourally aware society.	Secure funding and resources for planetary health.
CORE ELEMENTS	Reform institutional strategies at federal and state levels. Foster stonger collaboration across STIE (science, technology, innovation, economy). Promote sustainable management of natural assets.	Transition subsidies from harmful to beneficial. Support CSR initiatives with clear sustainable goals. Implement measures to minimise the harmful use of chemicals in agriculture.	Develop integrated campaigns for responsible consumption. Educate and train farmers on new sustainable technology. Promote healthy eating habits using behavioural insights.	Develop integrated campaigns for responsible consumption. Educate and train farmers on new sustainable technology. Promote healthy eating habits using behavioural insights.	Introduce financial products for sustainable practices. Invest in local infrastructure and incentivise responsible consumption. Develop fiscal policies and subsidies to support green investments.

Figure 3-11: Five Systemic Shifts for Research and Education

Action Plans, Lead Agencies and Impact Tracking

Shift 1: Strengthening The Governance and Management of the Nation's Natural Khazanah

This shift focuses on embedding planetary health into Malaysia's research, education and public service systems by establishing dedicated institutional structures and governance frameworks. It aims to build capacity across sectors through evidence-informed training, coordinated RDICE efforts and platforms for collaboration, while tracking literacy, leadership and investment in planetary health research.

RESEARCH AND EDUCATION: SYSTHEMIC SHIFT 1

Strategies

Establish dedicated units in ministries and government agencies to conduct education and training initiatives for planetary health.

Develop a robust RDICE Governance framework.

Establish a nationally certified programme for on planetary health.

Short Term (2027)

1. Identify individuals to champion PH initiatives.
2. Develop training modules on planetary health for top government officials and policy makers.
3. Set up monitoring, reporting and evaluation systems for planetary health initiatives.
4. Create platforms for policymakers, industry and communities to regularly meet, exchange ideas and solve problems together to build trust and improve collaboration.
5. Appoint a lead agency to coordinate RDICE governance.
6. Design an organisational structure to help stakeholders identify and agree on strategic focus areas to drive RDICE activities, especially for planetary health.
7. Set common rules for how the planetary health RDICE structure works, including reporting formats, meeting schedules and funding coordination.
8. Build platforms for translational research that link industry and community needs with planetary health solutions.

Mid-Term(2030)

1. Develop evidence-informed education and training opportunities on planetary health.
- 1.1. Carry out training needs assessments based on the needs of target groups.
- 1.2. Deliver professional development using formal, informal and non-formal learning methods, informed by training needs.
- 1.3. Develop online training modules on planetary health for the public.

2. Empower champions to affect change
- 2.1. Identify leaders in communities, industries and indigenous groups to drive planetary health within the RDICE system.
- 2.2. Build platforms for RDICE stakeholders to meet regularly for updates, dialogue and problem-solving.

Long-Term (2050)

1. Track progress on planetary health literacy in the public sector
- 1.1. Use open digital platforms to promote access to planetary health education and training.
- 1.2. Develop dashboards to monitor and report progress.
- 1.3. Share results and impact through pilot projects, roadshows and engagement events.

2. Reform RDICE strategy development, reporting and financing processes
- 1.1. Create systems to track and report on RDICE progress, especially in planetary health.
- 1.2. Use foresight strategies to identify emerging research areas that can boost Malaysia's leadership in planetary health.
- 1.3. Improve financial incentives and simplify processes to increase private sector participation in planetary health RDICE.
- 1.4. Offer funding incentives for non-government actors to set up research institutions in niche planetary health areas, such as sustainable tropical environment management.
- 1.5. Make Malaysia a leader in and reference centre for planetary health research.

Lead Agencies	Impact tracking
Federal and state PSD, INTAN, statutory bodies, MOSTI, ASM, MOHE, NRES, DOSM, PETRA	• Level of awareness of the Malaysian civil service on planetary health. • Number of education and training programmes on planetary health. • Number of civil servants who have completed training on planetary health. • Number of top public leaders trained in planetary health. • Emerging strategic priorities on planetary health research. • State of play reports on planetary health. • Percent grant allocation for planetary health (out of total research grants disbursed). • Inter-agency dissemination events / networks / policy dialogues on planetary health.

Shift 2: Nurturing People to Lead a Healthy, Prosperous and Values-Driven Nation

This shift focuses on building a strong talent and institutional ecosystem to support planetary health education, training and research across Malaysia and the wider Global South. It includes establishing expert advisory groups, a one-stop centre and a national researcher development framework to mainstream planetary health literacy, foster lifelong learning and attract and retain research talent through targeted incentives and collaboration.

RESEARCH AND EDUCATION: SYSTHEMIC SHIFT 2

Strategies

Establish advisory group of experts for education and training on planetary health.
Develop one-stop centre for planetary health.
Develop a robust RDICE researcher development framework.

Short Term (2027)

1. Facilitate forums for dialogue between citizen, policymakers and scientists.
2. Define clear roles (Terms of Reference) and ensure diverse representation from education, training, industry and community.
3. Identify champions to lead planetary health education and training.
4. Ensure involvement from different ministries.
5. Develop strategies to improve planetary health awareness for all levels of society, supporting lifelong learning.
6. Assign a host agency and define its mandate, staffing needs, budget and performance metrics.
7. Ensure the centre has a sustainable business model.
8. Hire staff with strong sustainability knowledge who can connect different sustainability themes to planetary health.
9. Appoint a lead agency to oversee researcher development.
10. Ensure the researcher development framework:
    - 10.1. Includes a clear national direction.
    - 10.2. includes a clear national direction and integrates the Malaysian Code of Responsible Conduct for Research.
    - 10.3. Includes essential regulatory knowledge and skill sets for both academic and non-academic careers.
    - 10.4. Maps clear research career pathways. Includes training on science communication and policy advocacy.

Mid-Term(2030)

1. **Create opportunities to integrate planetary health in education and training programmes**
    - 1.1. Embed planetary health content in academic programmes at all levels.
    - 1.2. Develop new PH programmes at tertiary level.
    - 1.3. Train selected champions (ToT) to lead initiatives in their organisations and communities.
    - 1.4. Strengthen quality assurance for both formal and non-formal PH education and training.
2. **Operationalise the one-stop centre for a heathier and sustainable Malaysia**
    - 2.1. Design simple toolkits and digital content (e.g. apps with info and gamification) to raise awareness.
    - 2.2. Work with industry partners to develop certification programmes in planetary health.
    - 2.3. Ensure both physical and online access to information and services.
    - 2.4. Promote sector-specific strategies to help MSMEs shift to sustainable practices.
3. **Develop a researcher development framework for Malaysia's RDICE ecosystem**
    - 3.1. Conduct validation with stakeholders inside and outside academia to confirm key competencies.
    - 3.2. Translate the framework into training modules.
    - 3.3. Implement ToT initiatives across universities, research institutes, businesses and NGOs
    - 3.4. Encourage researchers to build their own networks for growth and collaboration.

Long-Term (2050)

1. **Track progress on planetary health literacy in the education and training sector**
    - 1.1. Share updates with ministries and national councils.
    - 1.2. Advocate for planetary health to be part of education and training reform strategies.
2. **Operationalise the one-stop centre for a heathier and sustainable Global South**
    - 2.1. Expand the one-stop centre's services beyond Malaysia and establish it as a key training hub for planetary health in the Global South.
3. **Develop incentives to increase investment in RDICE talent development agenda**
    - 3.1. Ensure the framework includes financial incentives to support researcher growth.
    - 3.2. Outline incentives for cross-agency researcher mobility.
    - 3.3. Include strategies to attract foreign researchers and Malaysian diasporas to join Malaysia's RDICE ecosystem.

Lead Agencies	Impact tracking	
MOE, MOHE, MOSTI, KBS, KESUMA, HRD Corp, KPWKM, KPKT, KE	• Level of awareness of the Malaysian youth on planetary health (Survey study). • Proportion of training programmes with a specific focus on planetary health (out of total training programmes registered). • Number of education and training programmes on planetary health.	• Number of participants who have completed training on planetary health. • Percent operation of the one-stop centre in five years. • Number of research scholars trained and developed. • State of play reports on Malaysia's talent within the RDICE ecosystem. • Number of strategic programmes connecting Malaysia's RDICE communities with foreign researchers and Malaysian diasporas abroad.

Shift 3: Planet-Friendly Businesses

This shift focuses on establishing a Malaysian Standard for Planetary Health (MSPH) and increasing private sector participation in the RDICE ecosystem. It aims to embed planetary health principles in business practices through clear standards, compliance mechanisms and incentives, while strengthening public-private collaboration in research, innovation and talent development.

RESEARCH AND EDUCATION: SYSTHEMIC SHIFT 3

Strategies

Develop a Malaysian Standard for Planetary Health (MSPH).

Incentivise participation of business enterprises in Malaysia's RDCIE ecosystem.

Short Term (2027)

1. Assign a lead agency to oversee MSPH development.
2. Clearly define who will enforce MSPH and what happens in case of non-compliance.
3. Define how businesses can contribute to RDICE (e.g. talent development, R&D, advisory, policy support, implementation, CSR).

Mid-Term(2030)

1. **Develop the Malaysian Standards for Planetary Health (MSPH and integrate planetary health components in existing academic programmes across all educational levels.**
   - 1.1. Define the purpose, scope and criteria for MSPH in Malaysia.
   - 1.2. Identify key sectors for early adoption.
   - 1.3. Set a timeline for adoption based on different levels of readiness across industries.
   - 1.4. Organise outreach activities to inform stakeholders about MSPH.
   - 1.5. Inform organisations about costs, integration steps and risks of non-compliance.
   - 1.6. Provide training on MSPH and how to apply it.
   - 1.7. Offer grants or tax breaks for MSPH training and compliance.

2.Establish a roadmap to increase business enterprise participation in Malaysia's RDICE ecosystem
   - 2.1. Review current public-private partnership (PPP) practices in RDICE.
   - 2.2. Offer financial incentives to encourage participation, tailored to business size.

Long-Term (2050)

1. Encourage adoption of MSPH across industries
   - 1.1. Encourage companies to form networks and alliances to promote MSPH adoption.
   - 1.2. Host events where organisations share experiences with MSPH adoption.
   - 1.3. Provide mentoring or consultation services to support adoption and compliance.

2.Track progress on planetary health in the RDICE ecosystem.
   - 2.1. Set up systems to report business progress in RDICE and share updates through public reports and dialogues.
   - 2.2. Recognise outstanding contributions from businesses through awards or formal recognition.

Lead Agencies	Impact tracking
MITI, DOSM, MOSTI, ASM, MECD, SME Corp	• Percent progress development of the MSPH. • State of play reports on PPP and models of engagement suitable for MSMEs. • Inter-agency dissemination events / networks / policy dialogues on planetary health.

Shift 4: Effective Communication, Behavioural and Values Mindset

This shift focuses on developing a national CEPAA strategy and brand positioning framework to raise public awareness and elevate Malaysia's profile in planetary health research. It combines inclusive, culturally grounded communication approaches with coordinated science promotion efforts to build trust, shift behaviours and strengthen Malaysia's visibility in regional and global research landscapes.

RESEARCH AND EDUCATION: SYSTHEMIC SHIFT 4

Strategies

Develop a communication, education, public awareness and action (CEPAA) strategy for planetary health.
Develop a national brand positioning strategy for Malaysia's planetary health research.
Mainstream planetary health into the curriculum at all levels,

Short Term (2027)

1. Appoint a lead agency to coordinate the CEPAA strategy for education and training.

2. Collaborate with local leaders, institutions (schools, IHLs, etc) to make positive changes on planetary health topics.

3. Define the core values of the CEPAA strategy, which should:

- 3.1. Combine cultural, religious, ethical and scientific perspectives.
- 3.2. Be inclusive of all parts of society.
- 3.3. Start early with targeted efforts for women, youth, seniors, persons with disabilities and vulnerable groups.
- 3.4. Reflect current media and communication trends.
- 3.5. Promote free or affordable learning materials and open access to knowledge.
- 3.6. Outline resources, partner agencies, monitoring methods and a sustainable business model.
- 3.7. Mobilise support from state governments, faith-based organisations and civil society.

4. Identify a lead agency to assess the current state of Malaysia's research community and science communication. This includes reviewing:

- 4.1. Public awareness and perception on RDICE work by Malaysian
- 4.2. Communication strategies used by universities, research institutions and other organisations to promote their researchers and research output.

Mid-Term(2030)

1. Formulate CEPAA strategy

- 1.1. Ensure the strategy is developed by a team that includes policymakers, educators, business and media professionals, civil society, faith-based groups and indigenous communities.
- 1.2. Push for public service announcements that are clear and build trust.
- 1.3. Work with content creators and educators to co-create accessible materials for diverse audiences.
- 1.4. Use a mix of formats (e.g. workshops, dramas, talk shows, cartoons, documentaries, podcasts, films) to share planetary health knowledge.
- 1.5. Organise advocacy events like conferences, roadshows and festivals to engage the public.
- 1.6. Host knowledge-sharing events both online and in person to spread best practices.

2. Interagency coordination in brand positioning strategy development:

- 2.1. Formulate brand positioning strategy which
  - 2.1.1. Demarcates duties of care applicable for individual researchers and organisations that they are affiliated with regarding brand positioning of researchers and research output.
  - 2.1.2. Incorporates a sound and effective communication plan to foster strong visibility of RDICE activities and output, for knowledge sharing, increasing collaboration among leading institutions and increasing Malaysia's regional and global presence.

Long-Term (2050)

1. Review and assess effectiveness of CEPAA strategy

- 1.1. Use evidence and data to evaluate the effectiveness of the CEPAA strategy.
- 1.2. Apply behavioural science tools (like nudge theory) to encourage planet-friendly behaviours.

2. Review and assess brand positioning strategy

- 2.1. Track and report on the success of efforts to improve Malaysia's visibility in planetary health research.

Lead Agencies	Impact tracking
MoC, KPN, MOTAC, MOSTI, ASM, MOE, MOHE,	• State of play reports on government CEPAA initiatives on planetary health. • CEPAA activities based on core focus of individual ministries. • Inter-agency dissemination events / networks / policy dialogues on planetary health .

Shift 5: Sustainable Financing and Resourcing Planetary Health Development Initiatives

This shift focuses on establishing sustainable financing mechanisms to support Malaysia's long-term leadership in education, training and research, particularly in planetary health and STI. It seeks to diversify funding sources through public-private partnerships, tax incentives and community engagement, while promoting scalable models for the Global South.

RESEARCH AND EDUCATION: SYSTHEMIC SHIFT 5

Strategies
Develop a roadmap for sustainable financing of education, training and research to support Malaysia's leadership in science, technology and innovation (STI).
Short Term (2027)
1. Track how NGOs contribute to national education, training and research agendas, including monetary gifts or in-kind contributions under Section 44 of the Income Tax Act 1967. 2. Use this information to guide the development of the financing roadmap. 3. Involve the All-Party Parliamentary Group Malaysia on SDG (APPGM-SDG) to let constituencies identify priority projects for funding. 4. Ask key stakeholders to define priority funding areas—planetary health should be one of them
Mid-Term(2030)
1. **Diversify contribution pathways for sustainable education, training and research.** Ministries and government agencies involved in education, training and research should increase pathways for externals to: 1.1. Give donations or gifts through different financing models and partnerships. 1.2. Share resources through agreements and joint ventures. 1.3. Set up consortiums, networks and centres of excellence to support collaboration in education, training and research.
Long-Term (2050)
1. **Promote sustainable financing for a heathier and sustainable Global South** 1.1. Run ongoing communication, education, public awareness and action (CEPAA) campaigns to increase understanding and public support for sustainable financing. 1.2. Encourage sharing of Malaysia's successful practices with the Global South to inspire similar efforts regionally and globally.

Lead Agencies	Impact tracking
MOF, Inland Revenue Board	• Diversity of financial models beyond government expenditure. • State of play reports on financing initiatives related to education, training and research.

Energy Transition

Fossil fuels have long powered Malaysia's economy, supporting industrial growth, transportation and exports. However, they have also harmed the environment and contributed to the breach of planetary boundaries described in Chapter 1. Malaysia must now accelerate a just and inclusive energy transition that protects both people and the planet, while supporting sustainable economic development. If managed well, the energy transition can drive job creation, stimulate growth and improve health and well-being. But the change process must be fair, inclusive and systemic, ensuring no one is left behind. As the world grapples with overlapping crises, including geopolitical instability, economic shocks and climate-related disasters, countries must balance "the energy triangle" of security and access, affordability and environmental sustainability. (World Economic Forum, 2023).

Malaysia's National Energy Transition Roadmap (NETR) outlines a long-term, renewables-focused energy pathway. By 2050, the country's energy demand is expected to increase by 60 percent (from 2018 levels), with a population projected to exceed 40 million. The roadmap envisions a cleaner, more inclusive and more resilient energy system capable of supporting this growth without compromising environmental goals.

The 2023 Energy Transition Index (ETI) produced by the World Economic Forum ranks Malaysia 40th globally and highest in Southeast Asia, with a score of 60.1. This means that the country enjoys strong energy security, driven by a diverse mix of energy sources and a reliable supply. Malaysia is acknowledged alongside advanced economies like the United States and Australia for its performance on energy security. The ETI also measures "transition momentum"—the pace at which countries improve their energy systems—and Malaysia has shown consistent progress.

Key policies like the National Energy Policy (2022–2040) and the National Energy Transition Roadmap (NETR) are driving Malaysia's energy transition. The country is working to balance energy security, affordability and sustainability, with strategic investments in renewables, green tech and efficiency helping position it as a regional leader.

- A Diversified Energy Mix: Malaysia's energy system includes natural gas, coal, hydropower and renewables, enhancing resilience and reducing exposure to global shocks (a factor recognised in the ETI assessment (IRENA, 2023)).
- Renewable Energy (RE) Targets: Malaysia aims to increase the share of renewable energy to 31 percent by 2025, 40 percent by 2035 and 70 percent by 2050. Flagship projects include large-scale solar parks and distributed solar systems via the Net Energy Metering (NEM) and Large-Scale Solar (LSS) programmes (World Economic Forum, 2023).
- Energy Efficiency: The National Energy Efficiency Action Plan promotes the adoption of energy-saving technologies and practices in buildings, transportation and industries to reduce energy intensity. (World Economic Forum, 2023).
- Technology and Innovation: Malaysia is exploring clean hydrogen and battery storage to support grid flexibility and reliability (World Economic Forum, 2023).
- Regional Cooperation: Cross-border energy trade through the ASEAN Power Grid enhances regional energy security and promotes shared use of renewable resources. (IRENA, 2023).
- Circular Economy: Efforts are underway to improve the end-of-life management of renewable energy systems, particularly solar panels, through recycling and material recovery (World Economic Forum, 2023).

These actions are supported by robust policy frameworks, public-private partnerships and growing international cooperation. Together, they signal Malaysia's commitment to an energy future that is low-carbon, resilient and inclusive—aligned with its broader sustainable development goals. Despite this encouraging progress, significant challenges remain. The pace and scale of change must accelerate dramatically to meet national targets and global climate commitments. Systemic barriers, entrenched interests and uneven capacities across sectors continue to slow progress—highlighting the urgent need for bolder, more coordinated action.

Challenges and Insights

Malaysia's shift to sustainable energy is at a crucial turning point. An ecosystem-based analysis has highlighted key barriers to maintaining "Transition Momentum." While 72 percent of industry leaders acknowledge the harmful impacts of fossil fuels, only 9.7 percent are taking action to cut their use, citing limited influence, high costs and a lack of skilled talent as major obstacles.

Challenge 1: High Dependence on Fossil Fuels:

In 2022, Malaysia's energy demand was 1,164 TWh, 91 percent of which was met by fossil fuels – oil, coal and natural gas. These fuels contribute up to 90 percent of the country's CO2 emissions, highlighting the urgent need to break fossil fuel dependency and accelerate the shift to renewables. As shown in Figure 3 12, Malaysia's energy consumption remains dominated by fossil fuels, while renewables contribute only a small share.

Malaysia's rich petroleum and natural gas reserves have provided affordable energy and driven economic growth. But ongoing reliance on these finite resources is risky, given uncertain supply and global market volatility. As the world moves rapidly toward renewables, Malaysia's current energy security is no guarantee for the future—making urgent investment in sustainable alternatives essential. Shifting to cleaner energy will cut environmental and health harms, but it will take major investment, policy changes and new infrastructure.

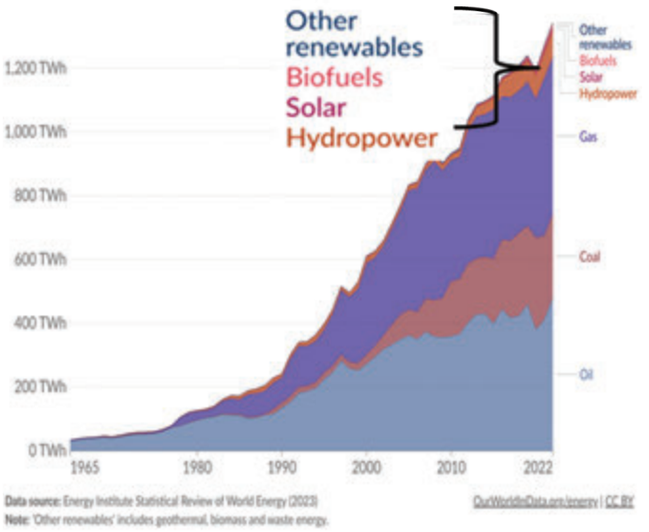


Figure 3-12: Energy Consumption by Source, Malaysia
Source: Energy Institute Statistical Review of World Energy (2023).

The National Energy Transition Roadmap (NETR) estimates RM1.85 trillion (USD 400 billion) is needed to reach net-zero, with 18 percent allocated to renewables and green mobility. Around 60 percent of these projects could be commercially viable without subsidies, but annual investments of RM15 to 18 billion (far less than one third of the money currently spent on subsidising fossil fuels each year) are needed to stay on course. While short-term costs may rise, the long-term gains—in health, environmental resilience and economic sustainability—far outweigh them.

Malaysia's energy strategy includes phasing out new coal plants, expanding solar power, promoting electric vehicles and hydrogen and investing in waste-to-energy technologies. These efforts, supported by corporate initiatives and climate finance tools, signal the potential for Malaysia's growing leadership in Southeast Asia's energy transition.

The country aims to reach 31 percent renewable energy capacity by 2025, but several promising sources—like Ocean Thermal Energy Conversion (OTEC), nuclear, hydrogen and energy efficiency—remain underused, thus running the risk of missing this target. Rising oil prices and shrinking petroleum reserves have disrupted the economy, highlighting the urgency of diversifying energy sources. Studies (Fayaz et al. (2022) and Qazi et al. (2021) , underscore the importance of public awareness, strong policy support and investment in innovation, including deep learning models to improve solar forecasting. Government efforts to boost foreign direct investment and public engagement are key to scaling up renewable energy.

Ecosystem Insight: Ocean Thermal Energy Conversion (OTEC) in Malaysia

What is OTEC? OTEC uses the heat stored in warm surface seawater and cold deep-sea water in tropical regions to generate electricity. If unused locally, the generated energy can also produce green hydrogen (H_2) via electrolysis.

Malaysia's Potential: Sabah and Sarawak waters offer an estimated 26,000 MW of OTEC capacity, with potential green H_2 revenues of USD 27 billion per year (at USD 6/kg H_2).

Case Study Insights (64 MW Net System):

- Electricity Cost: USD 0.16/kWh, reducible to USD 0.05/kWh
- Capital Cost: USD 550 million (OTEC only); USD 750 million with H_2 and mineral water production
- Payback Period: As low as 5 years
- ROI: Minimum 10 percent

Additional Value: Discharged deep-sea water can support marine farming, lithium extraction and bottled mineral water. At full efficiency, H_2 fuel cell vehicles could run at just USD 0.025/km. **Practice Insight: Energy Transition – Lessons from Germany, Implications for Malaysia**

Germany's Case: Germany's Energiewende demonstrates the value of a planned, gradual transition away from fossil fuels. Backed by over €500 billion since 2000, Germany phased out coal and nuclear power while scaling up solar and wind energy.

- Renewable share increased from 6 percent in 2000 to over 46 percent in 2022.
- Solar alone accounted for 10 percent of electricity generation.
- Investment in grid upgrades, feed-in tariffs and public engagement ensured energy reliability and economic stability despite cost fluctuations.

Malaysia's Context: Malaysia is in the early stages of its energy transition and benefit significantly from the lessons of Germany's experience.

- Reaching net-zero will require RM1.85 trillion, but current private sector participation is limited.
- Oil and gas reliance presents tough trade-offs between economic returns and climate action.
- The National Energy Transition Roadmap (NETR) provides direction, but falls short of Germany's strong policy enforcement, robust incentives and infrastructure preparedness (e.g., smart grids, storage).

What Malaysia Can Learn:

- Policy and Incentives: Introduce feed-in tariffs, green bonds and targeted tax incentives to attract long-term private investment.
- Grid Modernisation: Upgrade infrastructure to accommodate decentralised, intermittent renewables like solar and wind.
- Energy Storage: Invest in storage to ensure stability and manage supply fluctuations.
- Decentralised Solar: Encourage rooftop solar adoption through subsidies, following German's approach.
- Public Awareness: Engage the public and industry to build a culture of shared responsibility and energy citizenship.

Challenge 2: Constraints with Energy Infrastructure and Investment:

Malaysia's renewable energy (RE) share currently stands at 25 percent of total installed capacity, with steady progress towards the target of 70 percent by 2050. However, the current energy grid is not equipped to handle a high share of intermittent renewable energy. While Tenaga Nasional Berhad (TNB) has committed RM21 billion (2022–2024) to its "Grid of the Future" programme, focusing on making the grid renewables-ready, progress has been slow, hindered by high costs and technical complexity. Full-scale readiness will require an estimated RM400 billion by 2050 (Malaysia Energy Commission, 2023). Attracting large-scale investment is essential to enable this transition.

The TNB programme also supports regional cooperation through the ASEAN Power Grid, promoting cross-border electricity trade and accelerating decarbonisation. However, progress is slowed by limited stakeholder pressure and low public awareness of how fossil fuel use harms human health and drives planetary overshoot. Many people are aware of pollution caused by fossil fuels, but there is little understanding of the link between carbon emissions and broader consequences such as health risks, biodiversity loss and climate change. This lack of awareness limits the adoption of pro-planet behaviours, such as choosing renewable energy or supporting clean transport and industrial solutions.

Among business leaders, awareness of fossil fuel risks is high, but the direct connection between business practices and planetary health is often poorly understood. Many cite cost, competitiveness and skill gaps as barriers to clean energy adoption. While these concerns are real, long-term profitability and resilience depend on embracing the energy transition, even in the face of upfront costs. One of this Plan's greatest challenges is to communicate this reality clearly and convincingly.

Practice Insight: California's Energy Transition – Lessons for Malaysia

California's Experience: California's success demonstrates the value of large-scale investment, smart infrastructure and clear policy direction in advancing renewable energy while maintaining grid stability.

Key Actions Taken:

- Installed over 3 gigawatts of battery storage by 2023.
- Deployed smart grids and real-time energy management through the California Independent System Operator (CAISO).
- Introduced demand-side management and time-of-use pricing.
- Legislated a target of 100 percent clean electricity by 2045, supported by the Renewable Portfolio Standard.

Outcomes:

- Thirty-six percent of energy from renewables (2023).
- Improved grid reliability and reduced emissions.
- Growth in clean energy jobs and green innovation.

Malaysia's Current Challenges:

- Ninety-one percent fossil fuel reliance.
- Low investment in storage and weak grid infrastructure.
- Minimal demand-side policies.
- Fragmented regulations and limited funding.
- Skills gaps in the renewable energy workforce.

Key Lessons for Malaysia:

1. Invest in Grid-Scale Storage – Support stable renewable energy supply and manage demand fluctuations.
2. Modernise Grid Infrastructure – Facilitate real-time energy coordination and strengthen regional interconnectivity.
3. Adopt Demand-Side Management – Use incentives to drive energy-conscious consumer behaviour.
4. Strengthen Policy and Regulation – Clarify targets and improve enforcement mechanisms, including through the NETR.
5. Establish Renewable Energy Zones – Prioritise high-potential regions such as Sabah and Sarawak.
6. Develop the Green Workforce – Initiate targeted training and reskilling programmes to enable an inclusive energy transition.

Takeaway: Malaysia can accelerate its energy transition by adapting California's model of systemic investment, technological innovation and inclusive policymaking, while grounding it in local needs and contexts.

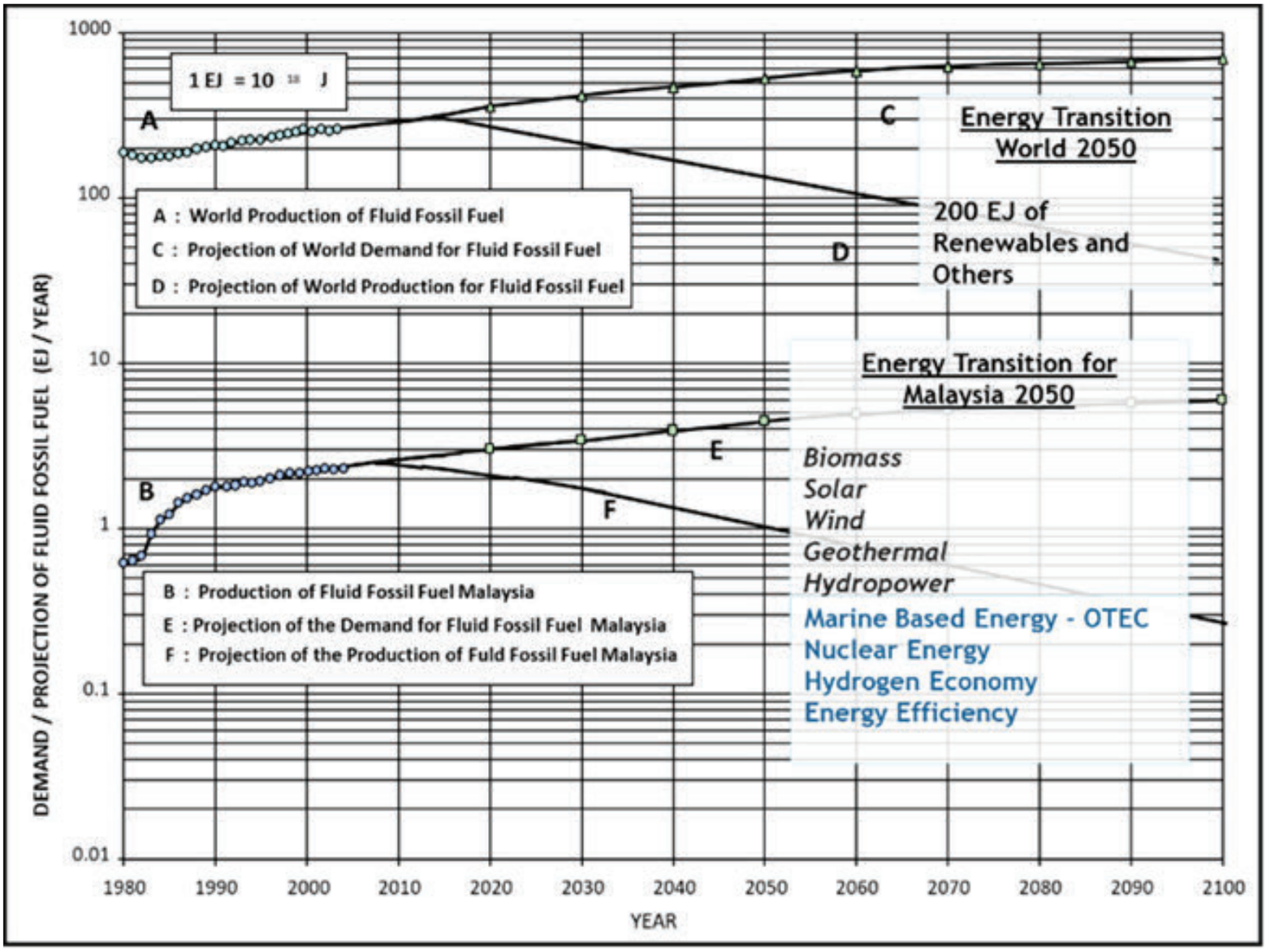


Figure 3-13: World vs Malaysia Projection of the Demand for Fluid Fossils Fuels

Source: Sopian, K and Daud, W.R.W., 2006.

Challenge 3: Inadequate Policy and Regulatory Framework:

Malaysia has made important strides in supporting its energy transition. Policy instruments such as the Renewable Energy Act, Feed-in

Tariffs (FiTs) and the National Energy Policy 2022–2040 have laid the foundation for a shift toward cleaner energy. The government's commitment to low-carbon development is clear and steps are being taken to restructure the economy around sustainability, including plans to phase out coal and significantly scale up renewables. However, continued reliance on natural gas as a transition fuel should be regularly assessed, given its higher cost relative to renewables and its environmental and health impacts.

To unlock the full potential of this transition, Malaysia must strengthen the consistency, coordination and clarity of its policy and regulatory environment. Existing frameworks are fragmented and often lack the long-term visibility and investor confidence needed to scale up renewable energy adoption.

A successful transition depends on policies that are not only coherent and forward-looking but also ensure affordability and accessibility for both households and businesses. At present, the high upfront cost of residential solar PV—averaging RM 20,000 for a 4-kW system—remains out of reach for many, particularly without targeted subsidies (such as are currently provided for fossil fuels) or financing mechanisms. Similarly, many businesses, especially SMEs, require clearer incentives to adopt renewables without compromising their competitiveness. Key issues include:

1. **Lack of Consistency and Long-Term Vision:** Frequent shifts in policy, such as changes to Large-Scale Solar (LSS) quota

   allocations, undermine investor confidence. What is needed is a predictable, long-term roadmap aligned with Malaysia's 2050 net-zero ambition, to provide certainty for investors and project developers alike.

2. **Limited Access to Affordable Financing:** While Net Energy Metering (NEM) has replaced FiTs, the financial returns, especially

   for small-scale producers, are more modest, affecting uptake. Low-interest loans, grants and targeted subsidies remain limited, particularly for SMEs and low-income households, constraining broader participation in the energy transition.

3. **Market Distortions from Fossil Fuel Subsidies:** Fossil fuel subsidies—amounting to RM15 billion in 2023—continue to distort

   the market by making high-carbon energy artificially cheap, thereby weakening the business case for renewables. Redirecting these subsidies to support development of clean energy is an essential step to level the playing field for a viable future.

Despite these challenges, Malaysia's energy outlook shows promise. The National Energy Policy 2022–2040 outlines a practical framework for this shift, emphasising demand-side management, green technology development and workforce upskilling. However, these efforts must be matched by coherent policies across housing, transport and industry, inclusive financing mechanisms and sustained political commitment.

Malaysia is on the right path but needs clearer policies, improved access to finance and a more clearly articulated and urgent phased reduction in fossil fuel subsidies. Only then can the country build a cleaner, more resilient and equitable energy future.

Practice Insight: Denmark's Transition and Lessons for Malaysia

Key Insight: Strong, consistent and long-term policies are essential for supporting renewable energy development and attracting investment.

Issue: Denmark faced the challenge of moving away from coal dependency while scaling up wind energy and maintaining energy security.

Approach:

- Established long-term targets: At least 50 percent renewable energy by 2030 and full fossil fuel independence by 2050.
- Provided sustained support for wind energy through subsidies, feed-in tariffs and competitive tenders - driving large-scale onshore and offshore wind investment, which now supplies around 50 percent of electricity.
- Implemented heavy taxation and carbon pricing on fossil fuels to incentivise energy efficiency and renewable adoption.
- Invested in a flexible grid and strong cross-border interconnections to efficiently manage variable renewable generation efficiently.

Outcomes:

- Drastic reduction in coal usage; renewables now dominate energy generation.
- Successful decoupling of economic growth from GHG emissions.
- High energy reliability alongside a large share of renewables; Denmark is now seen as a global leader in renewable integration.

Lessons for Malaysia:

Key Insight: Malaysia's energy transition could benefit significantly from clear targets, consistent policies and stronger investment in infrastructure and innovation.

Recommendations Based on Denmark's Experience:

1. Set Clear and Ambitious Renewable Energy Targets
    - Raise Malaysia's renewable targets (currently 31 percent by 2025 installed capacity) and commit to long-term goals such as 50 percent by 2030.
    - Define realistic milestones to boost investor confidence and enable effective tracking.
2. Strengthen Policy Frameworks and Incentives
    - Implement stable, long-term policies, such as predictable feed-in tariffs, tax incentives and carbon pricing.
    - Ensure clear and transparent regulations to reduce investment risk and foster strong public-private partnerships.
3. Modernise and Interconnect Grid Infrastructure
    - Expand smart grid infrastructure and regional interconnectivity to better manage variable renewable inputs.
    - Strengthen the "Grid of the Future" and enhance regional energy trading through initiatives like the ASEAN Power Grid.
4. Promote Public-Private Collaboration and R&D
    - Strengthen collaboration among government, industry and academia to fast-track clean energy innovation.
    - Enhance funding and incentives for R&D in solar, wind, hydrogen and grid technologies to reduce long-term costs and improve efficiency.

Challenge 4: Limited Communication of Social and Economic Impact Evidence

Malaysia's renewable energy efforts have begun delivering some modest social benefits:

- Solar PV Jobs: Between 2012 and 2019, the solar PV sector generated a sevenfold increase in job opportunities, contributing to measurable social gains (Chachuli et al., 2021).
- Carbon Emissions: From 2012 to 2018, solar PV initiatives contributed to a 0.16 percent reduction in Malaysia's carbon emissions. (Chachuli et. al, 2021) .

However, renewable energy adoption remains slow compared with Malaysia's neighbours. According to Atlas (2022) , Malaysia was the first ASEAN country to install solar PV in 2008, but its installed capacity between 2008 and 2020 saw very limited growth. In contrast, countries like Viet Nam and Thailand significantly scaled up both solar PV and bioenergy capacities, reflecting Malaysia's lag in market uptake.

The shift from a fossil fuel-based energy system to a low-carbon, sustainable future is complex and requires coordinated action across policy, technology and markets. As of 2023, Malaysia's installed renewable energy capacity is approximately 25 GW, including 4.5 GW from solar (Energy Commission of Malaysia). To support this transition, the government has allocated RM5 billion for green technology investments under the 12th Malaysia Plan (2021–2025).

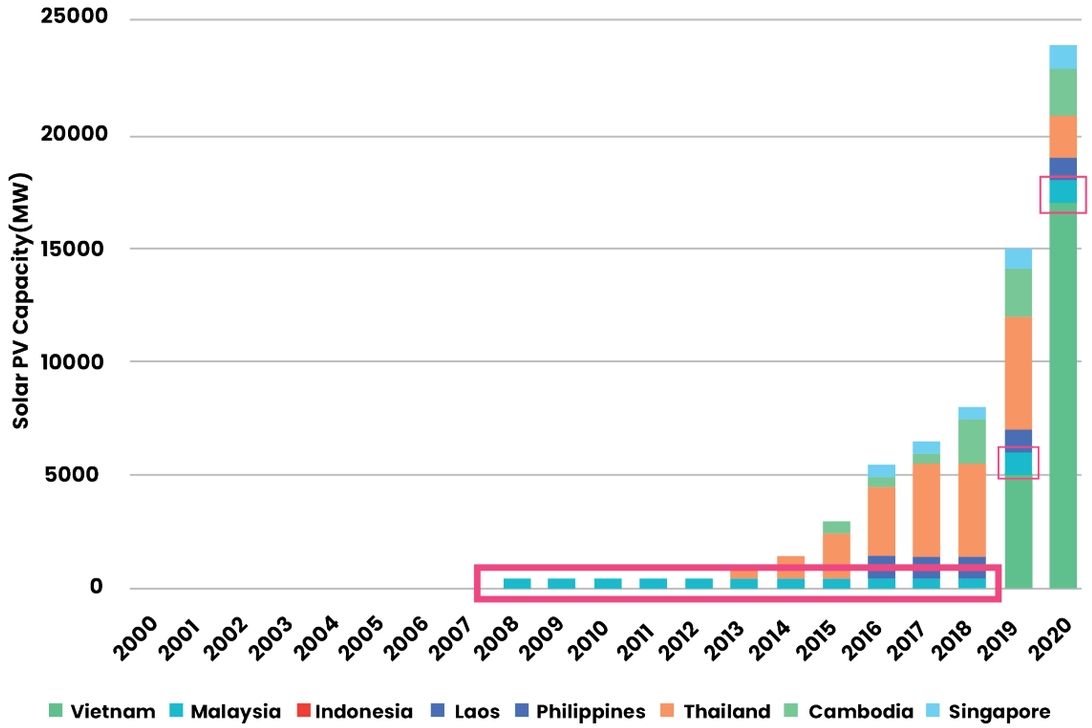


Figure 3-14: History of Solar PV Capacity in ASEAN

Malaysia's shift away from fossil fuels will affect jobs and communities reliant on coal and oil industries. While broader economic and social impacts are acknowledged, Malaysia has yet to present a strong, evidence-based narrative to guide a fair and inclusive energy transition. Plans to retrain workers and support affected communities are underway but remain at an early stage. A compelling case for a just transition, backed by rigorous socioeconomic analysis and inclusive engagement, is vital to sustain public trust and minimise social harms. (Malaysia' National Energy Transition Roadmap, 2024).

Practice Insight: Coal Phase-Out in Sabah:

Sabah is scaling down its dependency on coal by transitioning to solar and hydropower. Local workforce programmes have been initiated to provide employment opportunities in renewable sectors. Pilot projects under the NETR include solar farms and hybrid renewable systems that are generating local jobs.

Solar PV Growth Under Malaysia's Renewable Energy Policy: The Solar Photovoltaic (PV) initiative under the Feed-in Tariff (FiT) and Net Energy Metering (NEM) programmes has created job opportunities and diversified energy sources. A report by the Malaysia Energy Commission shows that the FiT mechanism significantly boosted investments and employment in solar-related sectors.

Practice Insight: Spain – Managing the Social Impact of Energy Transition

Key Insight: Addressing social and economic impacts is critical to ensuring a fair and equitable energy transition.

Challenges Faced:

- Job losses in coal-dependent regions
- Risk of social unrest due to economic dislocation

Approach Taken:

1. Just Transition Strategy (2019): Agreements between government, unions and industry to manage closures and safeguard worker rights.
2. Retraining and Reskilling: Funded programmes to upskill former coal workers for solar, wind and clean energy jobs.
3. Support for Affected Regions: Economic incentives and infrastructure projects to diversify coal-reliant economies.
4. Public-Private Partnerships: Encouraged investment in large-scale renewables, creating jobs and attracting capital.

Outcomes:

- Economic revitalisation in regions like Asturias through renewable energy projects.
- Worker protection ensured via severance, retraining and relocation support.
- Renewable energy leadership, with over 47 percent of electricity from renewables and >22 GW solar capacity by 2022.
- Public backing for energy reforms was achieved thanks to proactive social measures.

Malaysia: Lessons from Spain's Just Transition Experience
Current Context in Malaysia:

- High dependence on fossil fuels for jobs and revenue
- Limited evidence or planning on managing the socio-economic impacts of the transition
- Modest solar job creation to date and slow uptake in renewable sectors

Recommendations Informed by Spain's Example:

1. Develop a Just Transition Roadmap: Map vulnerable regions and sectors (e.g. Pengerang) and craft a clear plan for worker and community support.
2. Launch Retraining Programmes: Establish national reskilling schemes for fossil fuel workers in collaboration with TVET institutions and private industry.
3. Support Economic Diversification in Fossil Fuel Hubs: Designate transition zones with targeted investments in clean energy, sustainable manufacturing, or eco-tourism.
4. Institutionalise Social Dialogue: Engage unions, local governments and civil society through structured consultations on transition policies and priorities.
5. Expand Renewable Energy Projects: Scale up solar and wind investments, while addressing grid capacity and storage bottlenecks.
6. Provide Safety Nets: Ensure transitional income support, job placement services and welfare coverage for displaced workers.
7. Communicate Long-Term Gains: Build public support by clearly linking the transition to improved health, job creation and environmental protection.

Landscape Insight: Malaysia's Energy Transition Journey and Milestones

1. Short-Term Goals (2024–2030):

- Renewable Energy Targets: Raise renewable energy to 31 percent of installed capacity by 2025 and 40 percent by 2035.
- Policy Measures: Continued implementation of the Renewable Energy Act 2011, Feed-in Tariff (FiT) and Large-Scale Solar (LSS) programmes.
- Efficiency Gains: Drive nationwide energy savings through the Malaysia Energy Efficiency and Conservation (MEEC) Programme.

2. Medium-Term Goals (2030–2040):

- Grid Modernisation: Strengthen grid infrastructure to support variable renewables and storage systems.
- Diversification: Expand into wind, biomass and emerging technologies; increase R&D investment.
- Coal Phase-Out: Begin retiring coal-fired power plants, reducing coal's share in the energy mix.

3. Long-Term Goals (2040–2050):

- Carbon Neutrality: Achieve net-zero emissions by 2050 through deep decarbonisation and renewable energy dominance.
- Sustainable Development: Ensure the transition advances environmental goals, economic resilience and social inclusion.

The Systemic Shifts for Energy Transition

Malaysia's energy system remains heavily reliant on fossil fuels, locking the nation into patterns of high emissions, environmental degradation and health risks. Incremental change is no longer sufficient. A systemic shift is needed to accelerate the transition towards clean, renewable and efficient energy pathways that balance economic growth with sustainability and equity. The strategies in this section outline how Malaysia can strengthen energy security, reduce greenhouse gas emissions and drive innovation, while ensuring that the transition is just and inclusive for all communities.

Table 3-5: Energy Transition – Current and Future State

Current State	Future State
1. Energy Mix • 92.11 percent of primary energy comes from fossil fuels (2023). • Natural gas (~45 percent) and coal (~25 percent) dominate the mix. • Renewables contribute ~20 percent, mostly from hydropower.	• The National Energy Policy (NEP) target for Malaysia is to reduce the share of fossil fuels in the energy mix to 83% by 2024 and further by 2050. • Renewable sources such as solar, hydro and wind expected to dominate the mix by 2050. • Increased focus on energy efficiency and decentralised clean energy systems.
2. Energy Demand and Supply • Energy consumption rising steadily (~2.3 percent annually between 2015–2020). • Supply remains fossil-heavy, raising emissions and environmental risks	• Slower growth in energy demand expected (0.2 percent annually), with greater efficiency gains. • Cleaner supply via diversified renewables and reduced fossil fuel dependency.
3. Carbon Emissions • Energy consumption rising steadily (~2.3 percent annually between 2015–2020). • Supply remains fossil-heavy, raising emissions and environmental risks	• Significant reductions aligned with Paris Agreement and national net-zero ambitions. • Fossil fuel reliance reduced to ~77 percent by 2050, with coal phased out.
4. Air Quality and Health Risks • Poor air quality linked to fossil fuel use increases public health risks. • Renewable energy capacity at 25 GW (2023), with ~4.5 GW from solar.	• Smart grids, battery storage, carbon capture and advanced renewables expected to drive transition. • Major investment (e.g., RM5 billion under 12MP) supporting green technology and grid upgrades.
5. Technological Readiness and Advancements • Grid infrastructure is still adapting to accommodate high renewable integration. • Renewable energy capacity at 25 GW (2023), with ~4.5 GW from solar.	• Smart grids, battery storage, carbon capture and advanced renewables expected to drive transition. • Major investment (e.g., RM5 billion under 12MP) supporting green technology and grid upgrades.

Five Systemic Shifts for Energy Transition

Towards a healthier and more sustainable future, five systemic shifts are recommended to address the challenges documented in the earlier section.

	1	2	3	4	5
	Strengthening the Governance and Management of the Nation's Natural Khazanah	**Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation**	**Planet-Friendly Businesses**	**Effective Communication, Behavioural and Values Mindset**	**Sustainable Financing and Resourcing Planetary Health Development**
FOCUS	Intensify the shift towards cleaner energy sources, reduce the nation's carbon footprint and build a robust local clean energy supply chain.	Promote public awarness and action on fossil fuel use and health risk.	Accelerate the transisiton to renewable and clean energy for business, especially micro and SMEs.	Mobilise public and business support through strategic communication and behaviour change to drive a successful energy transition.	Build an enabling financial ecosystem that supports and scales planetary health action.
CORE ELEMENTS	Fast-track the development and adoption of emerging clean energy technologies. Boost public awareness and drive competitiveness across the clean energy sector. Forge stronger regional partnerships and fortify the local clean energy ecosystem.	Drive public awareness through targeted education campaigns and community outreach. Expand access to affordable clean energy and reliable public transport options. Equip stakeholders with practical knowledge to adopt sustainable alternatives.	Raise awareness and improve access to available clean energy incentives. Invest in capacity building for the business sector and strengthen enabling infrastructure. Deepen partnerships and scale up market-based incentive mechanisms.	Deliver clear, accessible, and compelling information on clean energy solutions. Run targeted awareness campaigns to build public trust and collective momentum. Highlight local success stories to inspire action and attract investor confidence.	Identify and unlock funding opportunities for impactful initiatives. Drive knowledge sharing and strengthen capacity across financial actors. Accelerate adoption of green financing mechanisms to mobilise capital at scale.

Figure 3-15: Five Systemic Shifts for Energy Transition

Action Plans, Lead Agencies and Impact Tracking.

Shift 1: Strengthening The Governance and Management of The Nation's Natural *Khazanah*

This shift focuses on accelerating Malaysia's transition to cleaner energy sources by diversifying the energy mix, scaling up emerging technologies like green hydrogen and CCS and building a competitive clean energy supply chain. It also emphasises cross-border grid integration, public awareness of fossil fuel-related trade risks and collaboration between government, industry and academia to drive innovation and high-value job creation.

ENERGY TRANSITION PILLAR: SYSTEMIC SHIFT 1

Strategies
Accelerate transition to cleaner energy sources, reduce carbon footprint and develop a robust local clean energy supply chain.
Short Term (2027)
1. Form a consortium to a. plan and assess new energy options (e.g. OTEC, geothermal in Sabah, nuclear). b. Conduct feasibility studies and identify pilot sites. c. Initiate pilot project planning. 2. Raise awareness on fossil fuel impacts and international trade barriers linked to energy traceability.
Mid-Term(2030)
1. Expand new energy ecosystems, including green hydrogen, carbon capture and storage (CCS), green mobility and improved deployment of biomass, hydropower and energy efficiency.
Long-Term (2050)
1. Establish a regional clean energy grid through collaboration with neighbouring countries. 2. Build a competitive energy supply chain that creates high-income jobs and new economic opportunities.

Lead Agencies	Impact tracking
JPM, Ekonomi, MITI, PETRA, NRES (Collaboration between ministries, industry and academia).	• Percentage use of fossil fuels versus clean energy, air quality, health indicators, awareness of international laws on the use of fossil-fuels and tariff-barriers among policymakers and industries (perception survey). • Level of compliance to ISO standard.

Shift 2: Nurturing People to Lead a Healthy, Prosperous and Values-Driven Nation

This shift focuses on increasing public awareness of the health risks associated with fossil fuel use, in line with planetary health principles. It prioritises transparent data access, cleaner energy adoption in industry, improved public transport standards and the implementation of robust CEPAA programmes in partnership with local councils and civil society organisations.

ENERGY TRANSITION PILLAR: SYSTEMIC SHIFT 2

Strategies
Strengthen public awareness and education to support behavioural shifts towards clean energy.
Short Term (2027)
1. Highlight health risks linked to fossil fuel use. 2. Improve public access to energy-related data. 3. Promote use of public transport and clean industrial energy. 4. Set competency standards for reliable public transport.
Mid-Term(2030)
1. Expand and refine Communication, Education, Public Awareness and Action (CEPAA) initiatives. 2. Collaborate with local councils, CSOs and religious groups. 3. Regularly update CEPAA based on stakeholder feedback and emerging trends. 4. Build digital and community learning platforms. By developing content for educators, policymakers and influencers. 5. Implement 'train-the-trainer' programmes (e.g. Open Learning – MyDigital/C4IR).
Long-Term (2050)
1. Empower informed choices by offering viable, planet-friendly alternatives to harmful practices.

Lead Agencies	Impact tracking
PETRA, Ministry of Economy, MOE, MOHR, MSME, Banks, MOHE, Ministry in charge of Indigenous affairs, State governments, KKOM. MyDigital Corporation (C4IR Malaysia)	• Amount of annual budget for reskilling and upskilling and communication strategies. • Assessment on public and industry perception on the use of fossil-fuels and clean energy (survey). • Regular assessment of public (survey). • Number of outreach programs (both traditional and online media). • Documentation of successful transition towards clean energy (including stories from the Indigenous population).

Shift 3: Planet-Friendly Businesses

This shift focuses on enabling businesses—especially micro and SMEs—to adopt clean energy through incentives, technical support and sustainability-linked certification. It promotes capacity-building via public research institutions, integrates clean energy into Halal standards, mandates responsible disclosure and strengthens public-private partnerships and regional collaboration to drive inclusive and commercially viable energy transition.

ENERGY TRANSITION PILLAR: SYSTEMIC SHIFT 3

Strategies
Support businesses—especially micro and SMEs—to adopt renewable and clean energy.
Short Term (2027)
1. Raise awareness among SMEs about available incentives (e.g. subsidies, tax breaks, grants, infrastructure and technical support). 2. Mandate public research institutions (PRIs) to enhance SME capabilities through access to cutting-edge facilities, testing labs, expert guidance and training programmes.
Mid-Term(2030)
1. Integrate clean energy adoption into Halal Certification requirements, with linked grants and support services. 2. Mandate responsible disclosure and frameworks by requiring sustainability reporting for all businesses, including SMEs, and developing a national sustainability framework tailored to business needs. 3. Boost private-sector engagement through promoting public-private partnerships in sustainability, with risk-sharing and co-investment mechanisms. 4. Using procurement policies and market-based incentives (rebates, discounts) to reward sustainability leaders
Long-Term (2050)
1. Strengthen RDICE and regional collaboration by expanding R&D funding, infrastructure and talent for advanced clean energy technologies. 2. Partner with ASEAN member states and relevant bodies on clean energy grid development to enhance energy security.

Lead Agencies	Impact tracking
MoF, Ministry of Economy, MOSTI, National SDG centre, MIDA, MITI and PMO	• The quantum of clean energy supply to consumers over time. • Number of PH, ESG and Halal certified businesses. • Number and quantum of the incentives and subsidies given for the adoption of clean energy and related technologies. • Number of companies benefiting from the incentives. • Number of toolkits available to businesses to assist them with energy transition planning, level of awareness on PH/ESG/SDG initiatives (perception surveys), participation in training and leadership programmes.

Shift 4: Effective Communication, Behavioural and Values Mindset

This shift focuses on fostering a values-driven mindset by promoting awareness and understanding of planetary health through targeted communication strategies. It aims to encourage behavioural change and cultivate a culture of sustainability and environmental responsibility within the Malaysian context.

SYSTHEMIC SHIFT 4: ENERGY TRANSITION PILLAR

Strategies	
Implement a strategic, inclusive communication plan to drive energy transition awareness and adoption.	
Short Term (2027)	
1. Tailor messaging to diverse audiences, including businesses and communities. 2. Promote access to affordable clean energy to attract quality FDI and open export opportunities to markets with strict clean energy regulations. 3. Launch a national campaign to build public buy-in and awareness of environmental quality and health co-benefits.	
Mid-Term(2030)	
1. Develop a digital "one-stop shop" with resources on clean energy technologies, incentives and advisory services. 2. Showcase local innovations and clean technologies to investors and businesses.	
Lead Agencies	**Impact tracking**
High-level PH Coordinating Committee/ Ministry of Economy, KKOMM / Digital	• Engagement sessions and sectoral company coverage (%). • Media coverage and social media engagement (articles, mentions, likes, shares, followers). • Stakeholder engagement (meetings, presentations, partnerships). • Public perception via surveys or polls on CCUS understanding. • Regular public opinion surveys. • Number of communities with digital boards.

Shift 5: Sustainable Financing and Resourcing Planetary Health Development Initiatives

This shift focuses on making clean energy more affordable and accessible through targeted fiscal incentives, financing mechanisms and supportive infrastructure. It aims to accelerate adoption by households and businesses, reduce costs through zero VAT and tax deductions and unlock private capital via blended finance and green fiscal instruments.

ENERGY TRANSITION PILLAR: SYSTEMIC SHIFT 5

Strategies	
Introduce cost-effective clean energy solutions to build widespread buy-in from households and businesses.	
Short Term (2027)	
1. Establish a zero VAT rate on the supply and installation of solar modules to make solar more affordable and accelerate adoption. 2. Offer funding and incentives (e.g. double tax deductions) to support clean energy uptake across sectors.	
Mid-Term(2030)	
1. Provide incentives and infrastructure support for energy storage systems, particularly for Large-Scale Solar (LSS) projects. 2. Introduce blended finance mechanisms such as concessional and subordinated loans to reduce risk and mobilise private capital for green projects.	
Long-Term (2050)	
1. Implement a comprehensive economic and financial framework to strengthen clean energy transition—including carbon markets, green bonds, environmental taxes, a sovereign wealth fund for planetary health and other fiscal tools to support clean energy infrastructure.	
Lead Agencies	**Impact tracking**
MITI, PETRA, SEDA, MOE, MOHE, MOHR, MIDA, MoF, BNM	• Reduction cost of clean energy system module coupled with the right technologies • Number of funding and incentives • Number of energy transition programmes implemented across the country • Number of LSS with energy storage • Number of install capacity

Values, Cultural Shift of Society , Behaviour Change and Communications

The Values, Cultural Shift of Society, Communication and Behavioural Change (VCBC) pillar of the NPHAP recognises that policies alone are not enough. Malaysia's transition to planetary health must be rooted in how people think, feel and act. VCBC aims to drive this transformation by embedding sustainability into the nation's collective identity and making environmental responsibility a shared value across all levels of society.

It seeks to create a cultural environment where the connection between human health, nature and community is deeply understood, and where sustainable choices become instinctive, normal and expected. Through values-based communication, inclusive education and community-led action, VCBC proposes to empower individuals, institutions and government to be active stewards of a healthier, more resilient Malaysia.

This is not just about raising awareness. It is about rewriting the national story. One where sustainability is a source of pride, and every citizen plays a role in shaping a better future.

Challenges and Insights

Challenge 1: Cultural Resistance to Behaviour Change:

Cultural resistance to sustainable practices is a primary challenge. Traditional behaviours such as high consumption patterns, resource heavy lifestyles, and dependence on non-renewable energy are deeply ingrained and widely accepted. Changing these habits is difficult, especially when there are no clear economic incentives or immediate personal benefits. Many people still see sustainability as a burden rather than a necessity. Actions such as reducing plastic use or conserving energy are often seen as inconvenient or costly. This mindset is even more common in rural areas, where access to sustainable alternatives is limited and traditional practices remain strong.

Ecosystem Insight: Cultural Leverage for Behaviour Change

Harnessing Cultural Values: Malaysia's diverse cultural heritage offers a strong foundation for embedding sustainability into social norms. By linking planetary health to themes like family well-being, community harmony and national pride, VCBC can align behaviour change with values that Malaysians already hold dear. For example, promoting sustainable actions to protect family health can motivate broader adoption.

Role of Religious and Community Leaders: Trusted local figures—particularly religious and community leaders—can be powerful allies. When sustainability is framed as a moral and ethical responsibility, their endorsement can shift public perception and normalise planet-friendly behaviours.

Case Study – Islamic Environmental Stewardship: A Malaysian campaign used Islamic principles of khalifah (stewardship) to promote environmental action. Imams delivered sermons linking environmental protection to religious duty, sparking mosque-led recycling initiatives and tree-planting drives. By framing sustainability as an act of faith, the campaign successfully translated awareness into grassroots action.

(WWF Malaysia, 2012)

Challenge 2: Fragmented Messaging and Lack of Coordination:

Planetary health messaging in Malaysia is fragmented. Government ministries, non-governmental organisations and private sector actors often operate in silos, each promoting their own priorities—energy conservation, biodiversity, climate adaptation—without a unified strategy or common narrative. This results in inconsistent and sometimes conflicting messages that confuse the public and weaken collective action.

Poor coordination across sectors hampers the creation of clear, compelling links between issues. For example, public campaigns on biodiversity may run parallel to energy-saving initiatives without explaining how the two are interdependent, causing the broader planetary health narrative to be lost and public understanding to remain shallow. This is further undermined by traditional and social media's appetite for sensational content over in-depth reporting. Without a coordinated approach and values-driven messaging, public engagement with planetary health will remain fragmented and reactive, rather than proactive.

Practice Insight: The Power of Unified Messaging

Strategic Alignment Builds Trust and Action: A unified communication strategy is critical for creating a coherent national narrative on planetary health. The Values, Culture, Behaviour and Communication (VCBC) pillar recognises the importance of aligning messaging across government, NGOs and the private sector to ensure consistent and credible information reaches the public. Unified messaging enhances trust and increases the likelihood of sustained behaviour change.

Lessons from the Ground: Focus group discussions highlight that when communication is clear, centralised and reinforced across multiple platforms, people are more likely to engage. A central platform with strong branding and culturally resonant messaging can overcome fragmentation and drive meaningful change.

Case Study – Plastic-Free Malaysia: This campaign successfully coordinated messages across ministries, NGOs and businesses. Simple, consistent calls to action like "Say No to Plastic Bags" and "Bring Your Own Containers" were promoted through schools, supermarkets and councils. The result: greater public participation, policy shifts (such as plastic straw bans) and heightened environmental awareness, proving the impact of unified, values-driven communication.

(Penang Green Council, 2020)

Challenge 3: Limited Engagement and Public Participation:

Public participation in sustainability initiatives remains low in Malaysia. Although awareness of issues like climate change, pollution and biodiversity loss is growing, this has not translated into widespread behavioural change. Much of this is due to the disconnect between individual actions and perceived impact. Many Malaysians cannot connect how their daily choices—such as saving water or cutting food waste—can contribute to broader environmental outcomes. Action is also limited by a lack of opportunities to engage and learn, especially in rural areas where communities often have fewer ways to participate in sustainability efforts.

Practice Insight: Engagement Through Inclusive Platforms

Public engagement works best when it is inclusive and tailored. VCBC recognises the importance of creating more accessible platforms, especially for rural and underserved communities. By adapting communication strategies to local contexts, VCBC can ensure all groups are included in the national sustainability dialogue.

While digital platforms are valuable, they must be supported by face-to-face efforts, such as community workshops, town halls and educational campaigns, that allow people to share ideas and co-create solutions. These approaches help build a sense of ownership and shared responsibility for planetary health.

Case Study: eBario Telecentre Initiative (TPOA), Sarawak: In Bario, Sarawak, the eBario Telecentre provided internet access and ICT training to the indigenous Kelabit people. Alongside digital access, the initiative offered workshops and community engagement activities. This hybrid approach respected traditional values while promoting sustainability, improving education and supporting local economic growth, showing how inclusive engagement can empower remote communities.

(TPOA, n.d)

Challenge 4: Misinformation and Public Misunderstanding:

The rise of digital and social media has opened new ways to communicate and accelerated the spread of misinformation about planetary health. False or misleading claims about climate change, environmental policies and sustainability weaken public understanding and slow behaviour change.

A compounding challenge is public distrust in official sources, leading to reliance on unverified or biased information. To counter this, VCBC promotes a multi-pronged approach: strengthening media literacy, implementing robust fact-checking and building trust through transparent, consistent communication from credible institutions.

Ecosystem Insight: Media Literacy and Trust-Building

Combating misinformation requires stronger media literacy and renewed public trust. VCBC can lead efforts to help Malaysians identify credible information sources while understanding the risks of false information. Promoting transparency in government communication is key. People are more likely to act when they trust the information they receive.

VCBC can partner with media outlets, schools and civil society to deliver fact-based campaigns that reinforce evidence-based narratives around planetary health.

Case Study: Finland's Media Literacy Curriculum: Finland integrates media literacy into its national curriculum, teaching students how to evaluate sources, spot misinformation and grasp the social impact of fake news. The programme also involves parents, media organisations and community groups. This whole-of-society approach has made Finland a global leader in media literacy and public trust, offering a useful model for Malaysia to adapt in its own planetary health communications. (Cord, 2022)

Challenge 5: Institutional Barriers and Policy Gaps:

Malaysia's communication and behaviour change efforts are hindered by fragmented institutional structures. Ministries and agencies often work in silos, with limited coordination on cross-cutting issues like planetary health. As a result, policy gaps persist and opportunities for a unified national strategy are missed.

For instance, environmental protection, public health and education are managed by separate ministries that seldom collaborate effectively on shared goals. Without mechanisms to align their efforts, the integration of planetary health into national policies remains patchy. Clear mandates for behaviour change—such as regulations on energy use, waste, or plastics—are lacking, further slowing progress.

Insights: Institutional Collaboration and Policy Integration

Institutional coordination is essential to embed planetary health in national governance. VCBC recognises that sustainable change requires stronger collaboration across ministries, agencies and other stakeholders. Aligning policies across sectors, such as education, health and economy, ensures a unified approach to planetary health.

Integrating behaviour change into policy frameworks provides the structural support needed for long-term impact. Clear regulations, targeted incentives and accountability mechanisms can help reinforce the cultural and behavioural shifts promoted by VCBC.

Case Study: Malaysia's National Policy on Climate Change (NPCC): The NPCC exemplifies how institutional collaboration can drive sustainability. Developed through a multi-stakeholder process, including ministries, NGOs and academic institutions, it aligned sectoral goals across energy, agriculture and transport systems. The policy includes clear implementation guidelines, incentives for green practices and a monitoring system. This kind of coordinated approach show how cross-sector integration advances both environmental and economic goals.

(Ministry of Natural Resources and Environment Malaysia, 2009)

The Systemic Shifts for Values, Culture, Behaviour Change and Communications

Lasting change in planetary health cannot be achieved through policies and technologies alone; it requires a fundamental shift in societal values, cultural norms and behaviours. Malaysia's current trajectory is constrained by consumption patterns, attitudes and communication gaps that reinforce unsustainable practices. A systemic shift is needed to nurture values that prioritise stewardship of the environment, solidarity and intergenerational responsibility. By embedding sustainability into culture, education, media and public discourse, and by fostering transparent, inclusive communication, Malaysia can build the collective awareness and behaviour change essential for a resilient and healthy future.

Table 3-6: VCBC – Current and Future States

Current State	Future State
• **Awareness vs. Action:** Public and corporate awareness of planetary health is growing, but behaviour change remains limited or inconsistent.	• **Awareness Translates to Action:** Planetary health awareness is embedded into daily behaviours, with both individuals and organisations actively integrating sustainable practices.
• **Cultural Mindset:** Short-term, consumption-driven mindsets dominate, leading to resistance toward sustainability.	• **Cultural Shift:** Environmental stewardship becomes a societal norm rooted in shared values with a long-term perspective.
• **Communication Strategy:** Efforts are fragmented, lacking unified messaging or resonance with cultural values.	• **Value-Based Communication:** Strategies emotionally engage and align with core societal values such as well-being, family and national pride.
• **Corporate Engagement:** Firms are aware of planetary health issues but lack understanding of their operational impact and show low uptake of proactive measures.	• **Corporate Leadership:** Firms understand and act on their environmental impact, integrating sustainability into core business operations and supply chains.
• **Public Engagement:** Limited outreach and uneven access to information, especially in rural areas	• **Widespread Participation:** Consistent and inclusive messaging reaches all demographics, with widespread community participation and ownership.
• **Education and Institutions:** Environmental messages are not systematically reinforced across sectors.	• **Integrated Ecosystem:** Schools, religious bodies and local authorities embed planetary health values into formal education and community life.
• **Social Norms:** Sustainable behaviours are viewed as exceptional and burdensome.	• **Sustainability Normalised:** Eco-friendly behaviours become the default—easy, accessible and supported by enabling policies and visible leadership.

Five Systemic Shifts and Strategies for Values, Culture, Behaviour Change and Communications

Towards a healthier and more sustainable future, five systemic shifts are recommended to address the challenges documented in the earlier section.

	1	2	3	4	5
	Strengthening the Governance and Management of the Nation's Natural Khazanah	**Nurturing People to Lead a Healthy, Prosperous and Values-driven Nation**	**Planet-Friendly Businesses**	**Effective Communication, Behavioural and Values Mindset**	**Sustainable Financing and Resourcing Planetary Health Development**
FOCUS	Embed sustainability into governance systems through policy reform and behaviour change integration.	Build environmental literacy and mobilise community action to drive grassroots sustainability and behavioural change.	Establish a national One-Stop Centre to educate, support, and scale planetary health action through training, strategic partnerships, and integrated ESG–SDG–PH alignment for businesses and institutions.	Drive widespread and lasting behaviour change to advance planetary health.	Establish a well-resourced, strategic communication ecosystem to scale planetary health impact nationwide.
CORE ELEMENTS	Advocate for policies that actively promote and enable sustainable behaviours. Embed planetary health principles into institutional mandates and decision-making. Design and implement long-term policy frameworks to secure a sustainable future.	Integrate planetary health into curricula across all levels of education. Support community-led sustainability initiatives to localise impact. Empower youth as catalysts for planetary health action and leadership.	Establish and operationalise the OSS mandate, structure, staffing, funding, and performance metrics. Deliver targeted training and accessible resources on Planetary Health, ESG, and SDGs for SMEs, corporates, and professionals. Develop and deploy communication tools, branding initiatives, and certification schemes to build visibility and investor confidence. Position the OSS as a regional leader by forging partnerships, driving cross-sector collaboration, and continuously updating standards and best practices.	Deliver impactful public awareness and education campaigns. Introduce a national behaviour change framework to guide policy and practice. Embed sustainable practices into everyday life through social norming and community engagement.	Assess resource and capacity needs across sectors and regions to enable effective communication. Develop and implement a compelling national communication strategy that highlights the value of investing in planetary health. Mobilise funding and technical support through strategic partnerships with government, private sector, and international actors. Build a resilient, multi-level communication infrastructure aligned with global best practices.

Figure 3-16: Five Systemic Shifts for Value, Culture, Behaviour Change and Communication

Action Plans, Lead Agencies and Impact Tracking

Shift 1: Strengthening The Governance and Management of the Nation's Natural *Khazanah*

This shift focuses on embedding planetary health into national development through long-term policy reform and behaviour change strategies. It aims to align institutional frameworks with sustainability goals by advocating for integrated policies, fostering cross-sector collaboration and ensuring environmental and health considerations are central to Malaysia's planning and governance.

VALUES, CULTURE and BEHAVIOUS SHIFT and COOMUNICATIONS: SHIFT 1

Strategies	
Catalyse policy reforms that align with VCBC behaviour change goals, fostering a supportive institutional environment. Institutionalise long-term policy frameworks to embed planetary health into national development agendas.	
Short Term (2027)	
1. Advocate for including behaviour change in national policies on environment, health and economy (e.g. bans on single-use plastics, renewable energy promotion). 2. Engage policymakers, industry and civil society to build consensus on key policy changes; host national forums to embed VCBC strategies in development plans.	
Long-Term (2050)	
1. Ensure planetary health principles are fully embedded in national policies, making sustainability central to Malaysia's development agenda. 2. Work with ministries and global partners to integrate sustainability into all policies—from urban planning to economic development.	
Lead Agencies	**Impact tracking**
MoC, NRES, MOSTI, MOH, MOHE, PMO	• Number of open and transparent platforms/forums conducted, stakeholder participation rate. • Number of research outputs shared in forums; quality of scientific evidence integrated into reports. • Percentage of districts reporting environmental and health data; integration of environmental issues in SDG reports. • Number of health interventions linked to environmental impacts; improvement in environmental health metrics. • Number of capacity-building initiatives; number of research collaborations initiated. • Number of cross-ministry initiatives executed; quality of SDG-related reporting.

Shift 2: Nurturing People to Lead a Healthy, Prosperous and Values-Driven Nation

This shift focuses on strengthening environmental literacy and empowering communities to take local action on sustainability, waste reduction and emissions. It promotes curriculum reform, teacher training and community-led initiatives—supported by incentives and public engagement—to foster a culture of responsibility and long-term behavioural change.

<table>
<tr><td rowspan="6">VALUES, CULTURE and BEHAVIOUS SHIFT and COOMUNICATIONS: SHIFT 2</td><td colspan="2">Strategies</td></tr>
<tr><td colspan="2">Raise environmental literacy among students to build a generation well-versed in sustainability and motivated to act.

Increase community participation in sustainability efforts to reduce waste, energy use and emissions at local levels</td></tr>
<tr><td colspan="2">Mid-Term(2030)</td></tr>
<tr><td colspan="2">1. Integrate planetary health into national curricula from primary to tertiary levels.

2. Collaborate with Ministry of Education to revise curricula to include sustainability, climate change and individual roles; support teacher training.

3. Expand public engagement via community-led actions (e.g. urban farming, waste reduction, energy saving).

4. Support local governments and communities with funding and technical assistance; incentivise participation via recognition and rewards.</td></tr>
<tr><td>Lead Agencies</td><td>Impact tracking</td></tr>
<tr><td>MoC, NRES, MOH, MOHE, MITI, KUSKOM</td><td>• Number of media outreach campaigns launched; reach and engagement metrics (e.g., views, shares).
• Number of community programmes implemented; feedback on PH integration in policies (via stakeholder surveys).
• Survey response rates; changes in public awareness/perception of PH issues (pre- and post-surveys).
• Number of academic programmes and research projects focused on PH; participation in university-led CEPA programmes.
• Number of industries engaged in PH outreach programmes; adoption of sustainable practices in industrial sectors.
• Number of entrepreneurs trained; adoption of PH-focused practices among small businesses.</td></tr>
</table>

Shift 3: Planet-Friendly Businesses

This shift focuses on establishing a one-stop Planetary Health resource centre to support businesses—especially MSMEs—in adopting sustainable practices aligned with planetary health, ESG and SDG goals. It aims to build national and global leadership through training, toolkits, branding initiatives and cross-sector partnerships, while providing ongoing support, certification and up-to-date guidance for sustainable development.

VALUES, CULTURE and BEHAVIOUS SHIFT and COOMUNICATIONS: SHIFT 3

Strategies
Establish a "One-Stop" (OSS) Planetary Health resource centre led by government agencies, GLCs and PRIs
Short Term (2027)
1. Define the OSS mandate, structure, staffing, funding and performance metrics. 2. Train OSS staff on PH, SDGs and ESG compliance through targeted workshops. 3. Educate businesses (esp. Micro and SMEs) on PH benefits through comms campaigns, webinars and outreach.
Mid-Term(2030)
1. Position OSS as a central hub for PH practices, with physical and online access. 2. Develop PH–ESG–SDG communication strategies, digital platforms and learning materials. 3. Establish OSS sub-units for training, business development and strategic planning. 4. Conduct training needs assessments and produce user-friendly resources. 5. Encourage collaboration between large corporations and SMEs to share sustainability resources and best practices 6. Launch a PH endorsement branding initiative to attract investment and raise Malaysia's global profile.
Long-Term (2050)
1. Support formation of PH-focused professional groups through networking and advocacy resources. 2. Position OSS as a Global South leader in PH education and training; build international partnerships 3. Develop industry-specific PH standards and certification schemes via stakeholder collaboration. 4. Collaborate with key stakeholders to define the criteria and roll out certifications through awareness campaigns and workshops. 5. Set up a task force to continuously update PH and ESG guidelines in line with global best practices.

Lead Agencies	Impact tracking
KE, MITI, MSME, Business Chambers	• Number of toolkits developed and distributed; business feedback on toolkit usability (via surveys). • Number of training programs conducted; participation rate of businesses; number of businesses adopting PH practices. • Number of MSMEs participating in training programs; number of MSMEs implementing PH/ESG/SDG practices. • Number of forums and leadership programs conducted; participation rate of business leaders; perception survey results on awareness.

Shift 4: Effective Communication, Behavioural and Values Mindset

This shift focuses on driving nationwide behavioural change through a structured communication strategy using the 4S Model (Survey, Stimulation, Strengthening and Sustainment) to make sustainable practices the cultural norm. It combines data-driven insights, mass media campaigns, community engagement, gamification and long-term incentives to embed planetary health values across all levels of society and business.

VALUES, CULTURE and BEHAVIOUS SHIFT and COMUNICATIONS: SHIFT 4

Strategies	
Enhance public understanding and initial behavioural shifts towards more sustainable practices. Increase public awareness about planetary health, reflected in higher engagement on social media platforms and increased participation in local sustainability initiatives. Develop a comprehensive dataset that provides insights into public understanding of planetary health and the factors influencing behaviour change, informing future strategies.	Devise a unified communication strategy that aligns the messaging of various stakeholders and sets the foundation for more cohesive public engagement. Sustain behaviour change, with more individuals and businesses consistently adopting sustainable practices. Drive widespread adoption of sustainable practices as the cultural norm, with tangible reductions in carbon emissions, water usage and waste generation. Sustain adoption of sustainable behaviours, with ongoing monitoring ensuring continuous improvement and adaptation
Short Term (2027)	
1. Implement the 4S Model (Survey, Stimulation, Strengthening, Sustainment) to systematically address behavioural change across the country. 1.1. Survey Phase: Collect data to identify public attitudes, knowledge gaps and current behaviours related to planetary health. 1.2. Stimulation Phase: Develop and disseminate targeted messages through multiple communication channels, focusing on raising awareness and promoting small, manageable actions that individuals can take. 1.3. Implementation: Roll out the 4S framework in partnership with community organisations and local governments, using digital platforms, traditional media and in-person engagement strategies. 2. Launch nationwide public awareness campaigns that educate Malaysians on the importance of planetary health.	2.1. Collaborate with media outlets, including television, radio and social media platforms, to disseminate clear, value-driven messages. Engage social media influencers and community leaders to amplify the reach and credibility of the campaign collaboration. 3. Conduct nationwide surveys to assess current public perceptions, attitudes and behaviours related to planetary health. 3.1. Partner with universities, research institutions and local governments to design and execute the surveys, ensuring broad participation across different regions and demographics. 4. Organise stakeholder workshops that bring together representatives from government ministries, NGOs, educational institutions and the private sector to align their communication efforts around planetary health. 4.1. Hold regional workshops across Malaysia to ensure representation from all sectors and regions. Use these workshops to identify key barriers and opportunities for
Mid-Term(2030)	
1. Implement the Strengthen Phase of the 4S model, which focuses on reinforcing sustainable behaviours through nudges, gamification and incentives. 1.1. Introduce reward systems for individuals and businesses that adopt sustainable practices, such as reduced energy consumption or waste reduction.	1.2. Develop digital platforms that gamify sustainability challenges, encouraging people to compete in adopting environmentally friendly behaviours. 1.3. Implementation: Partner with tech companies, NGOs and businesses to create these reward and gamification systems, ensuring they are accessible to all communities.
Long-Term (2050)	
1. Ensure that sustainable behaviours—such as reducing waste, conserving water and using renewable energy—become normalised across all segments of society. 1.1. Expand public recognition programs to celebrate sustainable businesses, communities and individuals. Use social proof and peer pressure to reinforce the idea that sustainability is the standard, not the exception.	2. Focus on the Sustainment Phase of the 4S model, ensuring that the behaviour changes achieved in the short and medium terms are sustained over time. 2.1. Continue providing incentives and recognition for individuals and businesses that maintain sustainable practices. 2.2. Work with research institutions and government agencies to create robust monitoring and evaluation systems that track behaviour change over time.

Lead Agencies	Impact tracking	
KE, MITI, MSMSE, Industry Association, Business Chambers	• Number of toolkits developed and distributed; number of businesses adopting PH/ESG/SDG practices. • Number of training programs conducted; participation rate of businesses; adoption rate of ESG practices. • Number of MSMEs participating in training programs; number of toolkits customised for MSMEs.	• Number of forums held; number of businesses adopting ESG/PH/SDG practices; member feedback via surveys. • Number of leadership programs conducted; participation rate of executives; changes in executive perceptions (via surveys).

Shift 5: Sustainable Financing and Resourcing Planetary Health Development Initiatives

This shift focuses on building a well-resourced, agile communication ecosystem to support the nationwide rollout of planetary health initiatives. It prioritises strategic partnerships, aligned messaging and scalable infrastructure—ensuring timely data access, funding mobilisation and alignment with global best practices to maximise reach and impact.

VALUES, CULTURE and BEHAVIOUS SHIFT and COOMUNICATIONS: SHIFT 5

Strategies	
1. Identify resource needs across sectors and regions to support a dynamic, nationwide communication ecosystem.	
Short Term (2027)	
1. Develop and deploy a communication strategy that clearly demonstrates the value of investing in planetary health initiatives 2. Secure adequate resources to implement this Action Plan. 3. Forge strategic partnerships to mobilise funding and technical support.	
Mid-Term(2030)	
1. Build a resilient, agile communication infrastructure at all administrative levels. 2. Align communication efforts with international best practices to attract support and scale impact.	
Lead Agencies	**Impact tracking**
Ministry of Communication, MOF, PMO, State Ministries and Local Councils, Smart partnerships, international organisations	• Amount of funding allocated for communication systems; functionality and accessibility of real-time data dashboards. • Total amount of funding allocated and utilised, funding distribution efficiency across states and districts. • Number of inter-agency meetings; progress reports on dashboard development and ecosystem implementation. • Percentage of districts with access to communication systems; accuracy and timeliness of state-level behavioural data. • Number of partnerships formed; contribution of private-sector funding; number of technical innovations implemented. • Amount of funding or technical support provided; alignment of initiatives with global best practices.

FROM PLANS TO ACTION

Having established the strategic foundations of the National Planetary Health Action Plan (NPHAP), including the six Key Result Areas, five Systemic Shifts and the enabling 8I ecosystem, this chapter focuses on how these ideas translate into action. It explores the critical levers required to operationalise the plan, from institutional reforms and governance structures to financing mechanisms, behavioural change strategies and communication systems. It presents the steps needed to translate vision into outcomes, ensuring that the transition from a zero-sum socioeconomic development model to one grounded in values-based development model (ROV) is achievable, accountable and inclusive.

Two key insights and challenges have emerged as particularly critical for advancing planetary health:

1. **Governance Is a Key Enabler — But Gaps in Enforcement Undermine Progress**

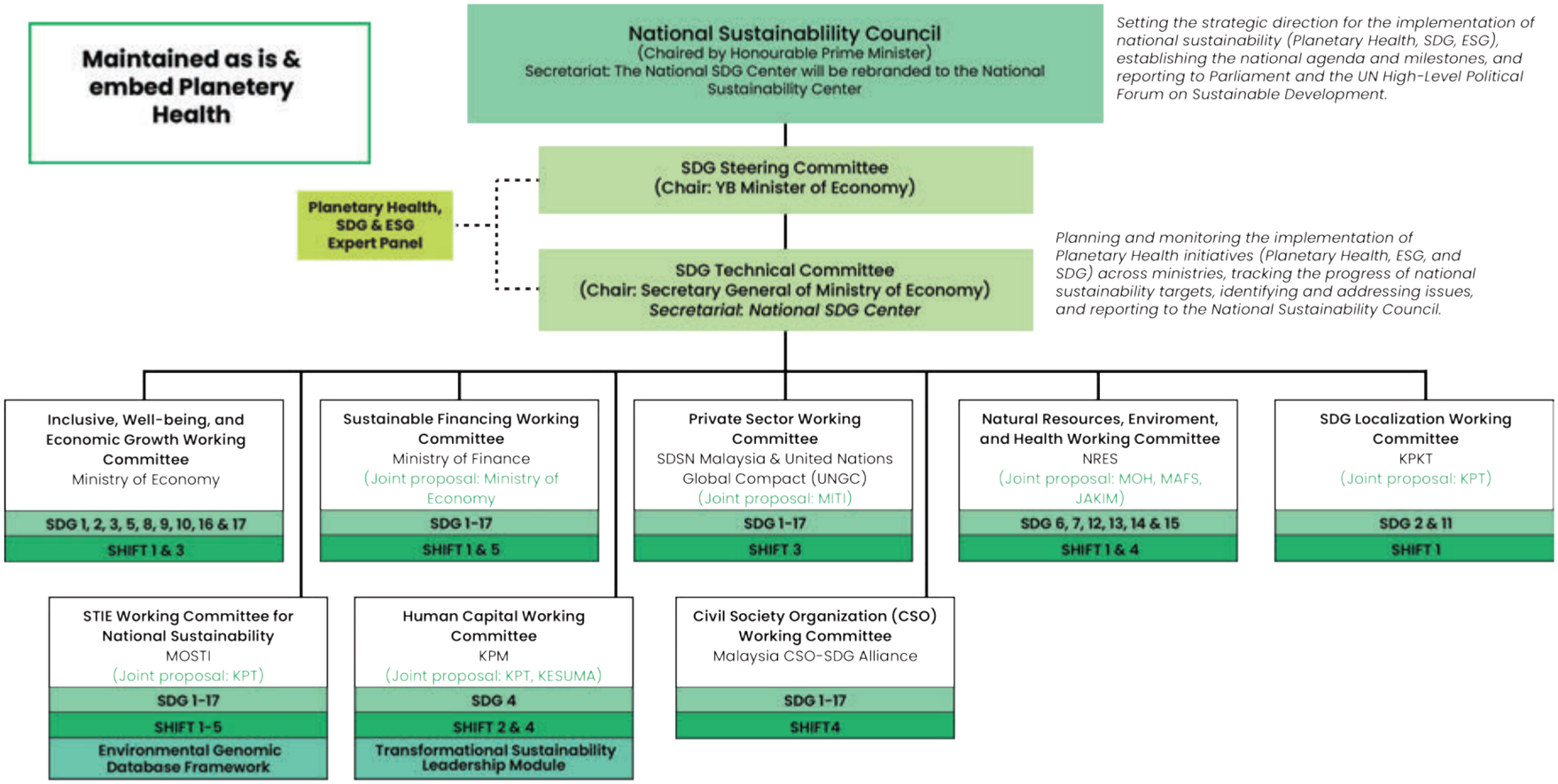
   Governance is central to advancing planetary health, but weak enforcement of policies and regulations continues to undermine sustained change. To strengthen impact, Malaysia must move beyond policy intent and focus on implementation, backed by data, digital infrastructure and targeted incentives. Key priorities include:
   - Consistent enforcement of existing laws across all sectors, regions and firm sizes, particularly to curb damaging practices such as open burning, river pollution and other breaches of planetary boundaries.
   - Governance reform that shifts from fragmented oversight to integrated, outcome-focused leadership.
   - Incentives for compliance, including support for sectors with lower capacity or weaker environmental standards and targeted measures such as tax relief and subsidies to encourage the adoption of planet-friendly technologies.

   Three mission-critical actions are needed to drive this shift:
   - Provide direction/ stewardship and enable enforcement – Empower a national level committee/commission/council to provide direction and stewardship on all planetary health and sustainability issues. The committee/commission/council should take a stronger role in ensuring compliance by all stakeholders across multiple jurisdictions.
   - Drive Impact – Establish robust, transparent data tracking systems to monitor progress and guide decisions.
   - Build the Digital Architecture – Develop a genomic and environmental database as a foundational evidence platform to support science-based governance.

2. **Behaviour change is essential for achieving the desired future state.**

   Priority actions include:
   - Improving communication strategies to promote transparency, accountability and education among policymakers, firms, organisations and individuals regarding their environmental impacts.
   - Investing in behavioural change programmes to reduce energy waste, inefficiency and environmentally harmful practices across all levels of society and the economy.

4.1 Enabling Direction, Stewardship and Enforcement: The Critical Role of the Majlis *Kemampanan* Negara



Achieving meaningful and lasting progress on sustainability and planetary health requires more than coordination. It requires a governance framework that ensures stewardship, accountability, coherence and effective enforcement. The success of the National Planetary Health Action Plan (NPHAP) hinges on strong institutional leadership with the mandate, authority and capacity to drive integrated, cross-sectoral action across government and society.

At the heart of this proposed transformation is the establishment of the ***Majlis Kemampanan Negara*** or **National Sustainability Council**, a high-level governance body mandated to align and enforce national commitments under the Sustainable Development Goals (SDGs), Environmental, Social and Governance (ESG) frameworks and Planetary Health priorities. In sub-chapter 3.1 .1, three governance options were assessed. The Plan endorses the most ambitious of the three: a bold redesign of Malaysia's sustainability architecture to drive system-wide transformation.

The proposed model includes the following key elements:

- Establishment **of the National Sustainability Council:** A high-level, cross-ministerial body tasked with integrating Planetary Health, SDGs and ESG into long-term national development planning, extending beyond the 2030 agenda to ensure continuity into the post-SDG era.
- Creation **of a Panel of Experts:** A science-based, multidisciplinary advisory group to support the Council with evidence-informed insights, foresight analysis and policy recommendations.
- Restructuring **of the SDG Committee into a National Sustainability Committee:** Chaired by the Chief Secretary to the Government, this upgraded body will coordinate implementation across ministries, supported by the formal inclusion of key sectoral agencies to enable a whole-of-government approach.

- **Strengthening of the National Sustainability Centre:** Upgraded into a central hub for strategy development, coordination and impact tracking across sustainability initiatives and planetary health domains.
- Formation **of a Science, Technology, Innovation and Economy (STIE) Working Committee:** Tasked with aligning innovation, research and economic development with Malaysia's sustainability goals and accelerating the deployment of solutions to complex and interlinked challenges.

This proposed governance model goes beyond coordination, providing the institutional clarity, strategic foresight and enforcement capability required to deliver on Malaysia's sustainability and planetary health ambitions. By embedding leadership, coherence and long-term continuity at the highest levels of government, this model positions Malaysia to become a regional leader in sustainability; securing prosperity, resilience and wellbeing for both people and planet.

4.2 Drive Impact: Establish a Robust Data Tracking Mechanisms to Guide and Measure Action.

An effective impact tracking mechanism is vital for addressing planetary health challenges in Malaysia. It must be tailored to the country's unique environmental, social and economic context to ensure interventions are relevant, evidence-based and outcome-driven.

The NPHAP Impact Tracking Framework is a robust, integrated system for monitoring, evaluating and improving the effectiveness of planetary health initiatives. The framework recognises the interconnectedness of human health, environmental sustainability and societal well-being, providing a structured approach to navigate these complexities. Ultimately, it supports Malaysia's efforts to improve performance within planetary boundaries and lower its global ecological impact.

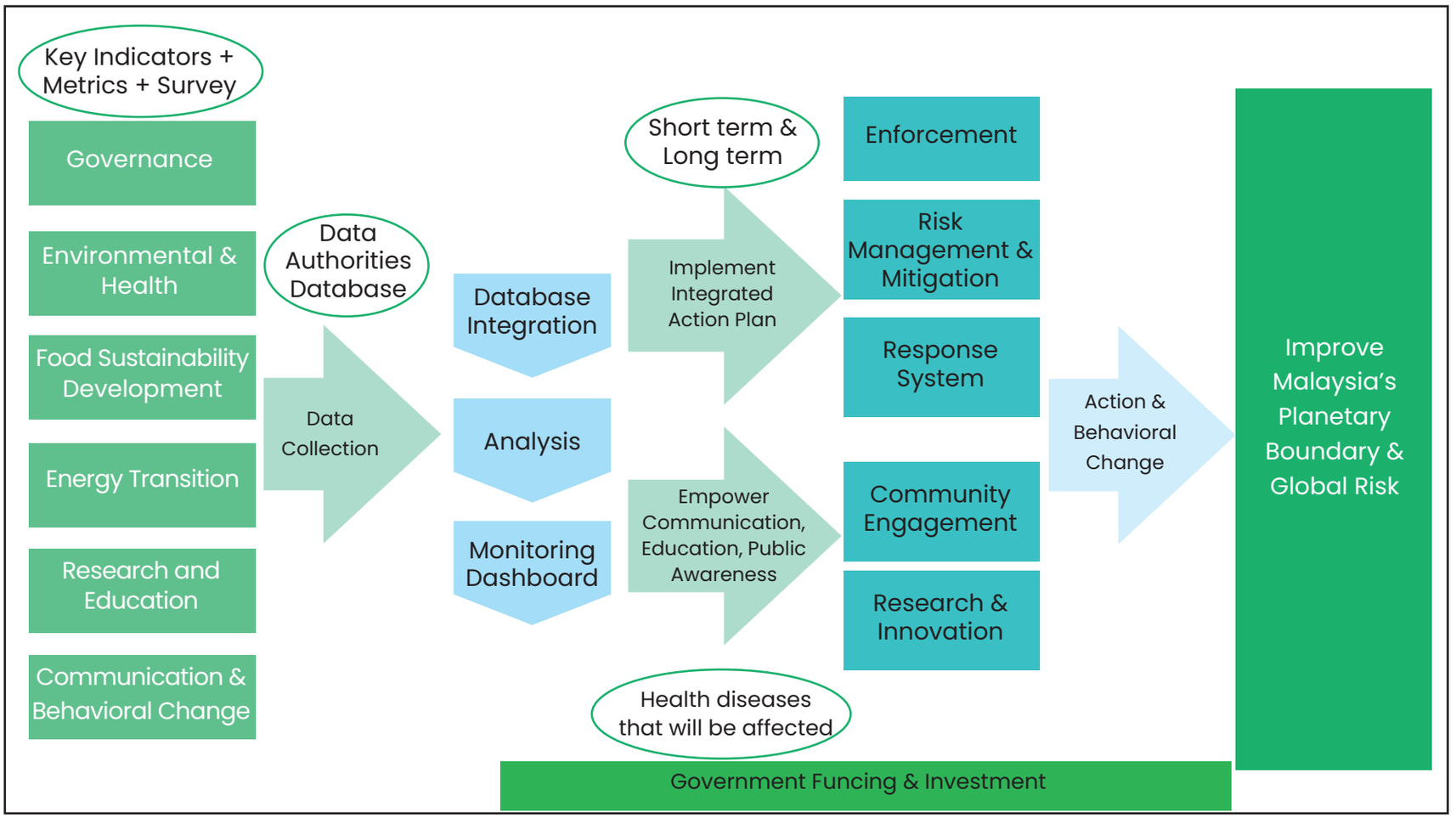


Figure 4-1: NPHAP Impact Tracking Framework

This framework integrates various domains, including data collection, integrated databases, analytics and monitoring dashboards, to implement the integrated NPHAP (Figure 4-1). It emphasises four core functions: enforcement, risk management, community engagement and research and innovation.

A set of clearly defined indicators underpins the framework, aligned with the six NPHAP pillars. Impact tracking metrics have been developed from key indicators within each NPHAP pillar, capturing the complexity of planetary health through both quantitative measures such as environmental quality, health outcomes and socioeconomic factors, as well as qualitative data through behavioural surveys and community engagement.

Recognising the critical role of data in shaping effective policy and action, the framework prioritises the establishment of a robust data collection and management ecosystem. This involves harmonising disparate databases, ensuring data accuracy and accessibility and fostering collaboration among data custodians. A centralised national database for planetary health will serve as a repository for monitoring, analysis and reporting—providing critical insights into Malaysia's progress towards national and global planetary health targets.

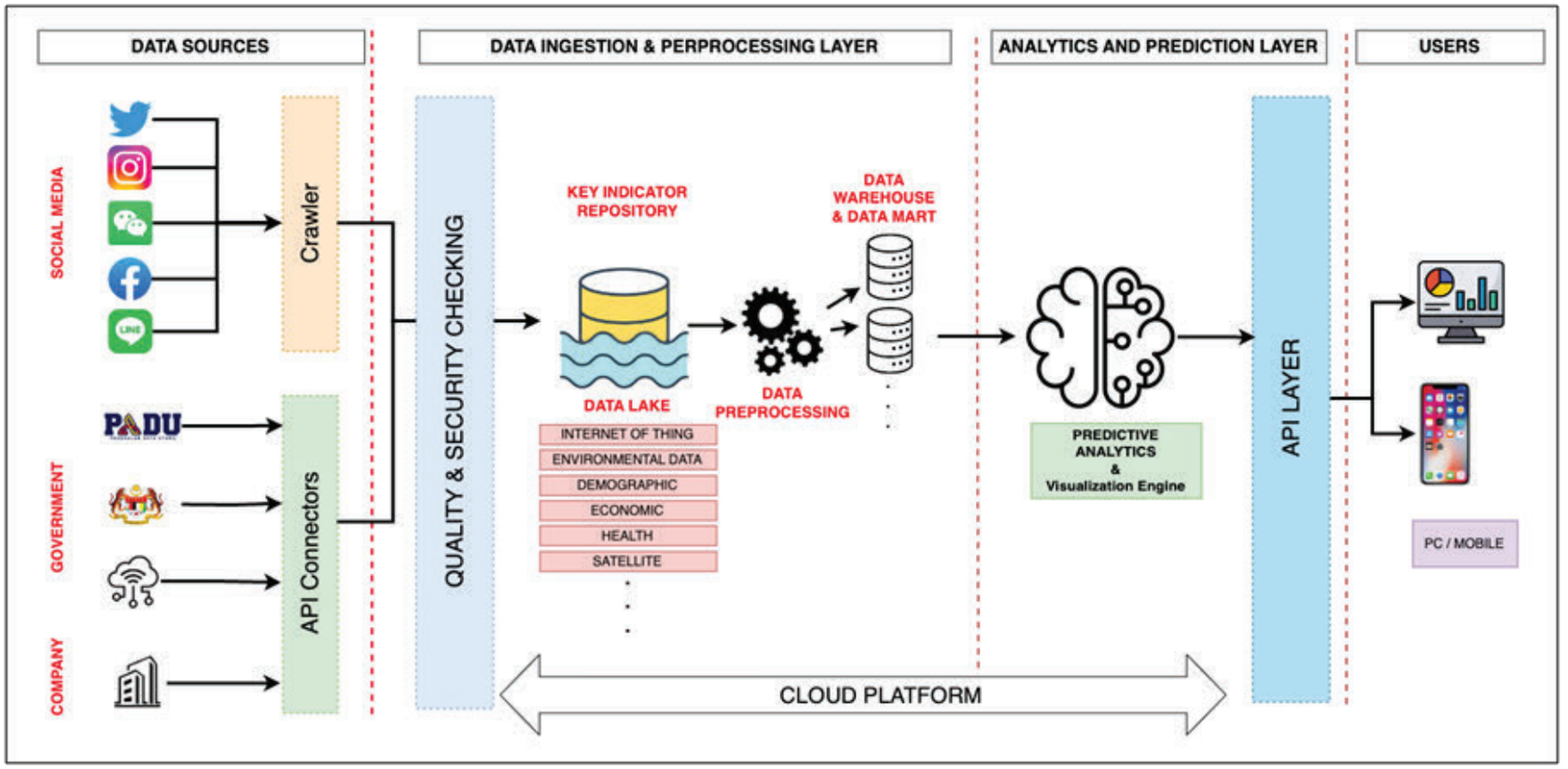


Figure 4-2: System Architecture for Database Management

System Architecture Breakdown:

1. **Data Ingestion Layer:** This layer collects data from various sources relevant to planetary health such as ministerial databases from the Ministry, stakeholder systems and social media platforms, including community sentiment analysis.
2. **Data Storage and Pre-processing Layer:** This layer stores data relevant to planetary health indicators, collected from diverse sources. The data undergoes a preprocessing stage to clean and organise the data for further analysis. A Data Lake serves as a storage repository for raw data in its original format, allowing for the standardisation of data formats that enables integration across different types and sources.

3. **Analytics and Prediction Layer:** This layer analyses the pre-processed data to identify trends, risks and relationships between different planetary health indicators, enabling predictive analytics and the development of the Impact Tracking Monitoring Dashboard. The output supports policy development and strategic action planning.
4. **Users**: The results of the analysis are made available to different levels of users, including:
    1. Government authorities, to support decision-making
    2. Academia and research institutions, to advance studies and innovation
    3. Communities, to foster engagement and awareness

Planetary Health Impact Tracking Analysis and Monitoring Dashboard: The integrated data undergoes thorough analysis to identify trends, patterns and potential areas of concern related to the key indicators within the NPHAP pillars. This analysis provides insights into the current state of planetary health, pinpointing areas that need improvement and forecasting potential future risks. These findings inform policy decisions that improve planetary health outcomes. This occurs via a monitoring dashboard that integrates data from various sources, offering actionable insights. The dashboard identifies gaps in current efforts, enables adaptable management strategies and supports evidence-based decision-making.

Actionable Insights for the Implementation of Integrated Action Plan: The Impact Tracking framework aims to ensure the enforcement of the National Planetary Health Action Plan (NPHAP) both immediately and in the long term. This includes monitoring compliance with NPHAP objectives, addressing any violations and continuously improving regulatory frameworks. By using a centralised database and analysis, this framework establishes mechanisms for developing response plans and implementing preventive measures, recognizing that planetary health challenges require collaborative action across national borders. Additionally, mechanisms to empower community engagement and education are crucial for effective and sustainable action.

Government Funding and Investment: Substantial government funding and investment are essential to implement the framework, scale successful interventions, and catalyse systemic change by building infrastructure for planetary health monitoring. This includes data collection, database management and the development of analytical dashboards. This environment will help Malaysia to strengthen contribution to international efforts, while simultaneously protecting the country's unique ecological and social context.

Engagement with the Government and Relevant Stakeholders as Data Authorities for Data Collection: To move forward, engaging with government agencies and relevant agencies is critical to establishing efficient data collection mechanisms and implementing impact tracking. Data custodians will be responsible for validating the existing dataset and identifying additional data sources based on the key indicators for short-term and long-term planetary health tracking.

Table 4-1: Data and Government Authorities

Data	Data Authorities (Government)
• Government Funding and Investment • Statistics • Index	1. Department of Statistics Malaysia (DOSM) 2. Ministry of Agriculture and Food Security (KPKM) 3. Ministry of Energy Transition and Water Transformation (PETRA) 4. Ministry of Environment and Water (JAS) 5. Ministry of Finance (MOF) 6. Ministry of Health of Malaysia (MOH) 7. Ministry of Natural Resources and Environmental Sustainability of Malaysia (NRES) *non-exhaustive

Short-term Implementation

To effectively translate the NPHAP into tangible outcomes, a strategic approach for short-term impact tracking implementation is essential. This approach aims to catalyse progress on major planetary health issues in Malaysia through targeted pilot projects, data-driven decision-making and a clear roadmap aligned with both short-term and long-term goals.

The initial phase will involve conducting rigorous feasibility studies to identify the most impactful and achievable pilot projects. These studies will assess the practicality, resource requirements and potential outcomes of interventions related to the major planetary health issues outlined in the NPHAP. By focusing on specific, actionable initiatives, this early phase can yield tangible outcomes, demonstrate the framework's value and build momentum for sustained action.

A key element of this approach is the development of compelling business cases for sustainability planning. These business cases will highlight the economic, social and environmental benefits of investing in planetary health initiatives. By quantifying the potential return on investment and highlighting successful pilot projects, the framework can mobilise support from both the public and private sectors, driving a shift towards more sustainable practices and policies

The NPHAP Impact Tracking Framework marks a major advance in Malaysia's planetary health agenda, offering a data-driven, collaborative approach to monitoring progress and shaping effective interventions. Its success depends on open access to reliable environmental, health and socioeconomic data, sufficient funding, and strong inter-agency coordination. By aligning impact tracking with the Action Plan and grounding it in behavioural and community data, the framework ensures that responses are targeted, adaptive and relevant. More than a monitoring tool, it enables informed policymaking and drives systemic change to help Malaysia stay within planetary boundaries while improving public health and wellbeing.

4.3 Build the Digital Architecture : The Environmental Genomic Database Framework as Evidence

Environmental genomic data is a critical asset for understanding Malaysia's biodiversity and its link to human and planetary health. A national Environmental genomic database can serve as the digital backbone for conservation, environmental monitoring and public health action. By consolidating data from universities, research institutions, government agencies and industry, Malaysia can improve its response to threats such as habitat destruction, zoonotic disease outbreaks and pollution.
A centralised interface linking distributed genomic databases through Application Programming Interfaces (APIs) is proposed to uphold FAIR principles (Findable, Accessible, Interoperable, Reusable). This ensures data custodians retain control while enabling seamless, secure data integration and cross-sector application of genomic insights.

Why an Environmental Genomic Database Matters

A national database cataloguing Malaysia's rich flora, fauna and microbial diversity will strengthen conservation efforts, enhance environmental risk assessments and support evidence-based policy decisions. Genomic tools are useful for addressing biodiversity loss, pollution, deforestation and climate change through genome-informed strategies.

Current State and the Way Forward

As noted above, a national database can support biodiversity conservation, risk assessment and evidence-based policymaking. The current challenge is that genomic data is fragmented across institutions, limiting its potential for policy, conservation and public health application. The solution lies in a centralised interface functioning as a metadata repository that connects existing databases while maintaining data ownership and security.
Aligning this initiative with regional efforts, such as ASEAN's biodiversity genomics, and integrating it with the Malaysia Open Science Platform (MOSP) will position Malaysia as a leader in genomic-based environmental and health innovation. This system can be used for pollution monitoring, disease vector tracking and predictive environmental assessments.

Key Challenges

- Data Fragmentation: Existing genomic datasets are siloed across multiple institutions and stored in varying formats, impeding interoperability.
- Data Security and Governance: Alignment with FAIR principles and national data security policies is essential.
- Funding and Infrastructure: Sustained investment in cloud storage, computing power and digital infrastructure is needed.
- Stakeholder Coordination: A governance mechanism is needed to ensure inter-agency collaboration.
- Capacity Building: Targeted training programmes are needed to develop skills in genomic analysis and database management.
- Public Awareness: Outreach is essential to build public understanding of genomics' role in biodiversity conservation, public health and agriculture.

Plan of Action

- **Leverage Existing Platforms**: Integrate the national environmental genomic database with the Malaysia Open Science Platform (MOSP) to enable immediate data-sharing and facilitate collaboration with international partners.
- **Develop a Centralised Interface:** Build a user-friendly, API-driven system to link and harmonise existing genomic databases, including:
    1. One Health database
    2. Humanitarian Data Exchange
    3. Malaysia Palm Oil Board's GenomSawit portal
    4. Universities and higher learning institutions
    5. Research Institutes
    6. State biodiversity agencies (e.g., Sabah Biodiversity Centre, Sarawak Forestry Department)

- **Prioritise Key Data Types and Applications**:
    1. DNA Barcoding for Biomonitoring: Use DNA barcoding of organisms (e.g. insects) as bioindicators for environmental change.
    2. Wastewater Surveillance: Track viral particles and pathogens and shifts in wastewater elements to detect disease outbreaks and pollution.
    3. Public Health Genomics: Integrate genomic and epidemiological data to assess environmental and human health risks.
- **Establish Data Governance and Policy Frameworks:** Ensure compliance with MOSP guidelines and the National Data Sharing Policy to uphold ethical, secure and effective genomic data management and use.

In summary, a robust National Environmental Genomic Database will empower Malaysia to make informed, data-driven decisions in biodiversity conservation, public health and sustainability policy and planning. By adopting a structured and collaborative approach, linking existing resources, safeguarding data security and engaging multiple stakeholders, Malaysia can solidify its position as a regional leader in genomic-driven environmental governance and management.

4.4 Shift Mindsets: Systems Thinking and Behavioural Transformation

Planetary health recognises the deep interdependence between human well-being and the Earth's natural systems. In an era of uncertainty and complex sustainability challenges, shifting mindsets and behaviours is critical to implementing the National Planetary Health Action Plan.

To support this transformation, a Transformational Sustainability Leadership Module (TSLM) has been developed. The module equips leaders across sectors with the mindset, tools and strategies to drive systems change. It introduces key concepts such as systems thinking, stakeholder engagement, visionary leadership and sustainability-driven innovation.

Drawing on real-world case studies, the TSLM promotes inclusive, interdisciplinary approaches and encourages self-reflection, especially around neglected human and cultural dimensions of change. It aims to empower both established leaders and emerging changemakers to inspire collective action and embed sustainability into policy, business and community practice.

Scan the QR code to explore the full module and access practical tools for leadership in the planetary health era.

4.5 Redefine Progress: Building Prosperity on Planetary Health

Over the last three centuries, economic and technological advances have created immense wealth—but too often at the expense of planetary health. As we breach key environmental limits, the stability of ecosystems, economies and human well-being is increasingly under threat.

This plan calls for a shift from a "zero-sum" model, where economic gain comes with environmental loss, towards a regenerative development model rooted in Return on Value (ROV), rather than solely on Return on Investment (ROI). A healthy planet is not a barrier to prosperity; it is the foundation of it. When nature thrives, so do people and economies.

To drive this transition, the NPHAP sets out five systemic shifts that will significantly raise ROV for all Malaysians by 2035 (see Figure 4-3):

1. **Protect and restore natural *khazanah*** by improving governance, curbing rent-seeking and unlocking sustainable value from ecosystems.
2. **Cultivate a values-driven society** by embedding 8R-values across all sectors to foster resilience, health and cohesion.
3. **Invest in planet-friendly enterprise** to create high-income, future-ready jobs that align with environmental and social priorities.
4. **Transform mindsets** through strategic communication that drives behavioural change and long-term sustainability.
5. **Mobilise finance and resources** to support people and businesses in adopting regenerative, planet-compatible models.

Together, these shifts reposition national progress around long-term value—for people, planet and prosperity.

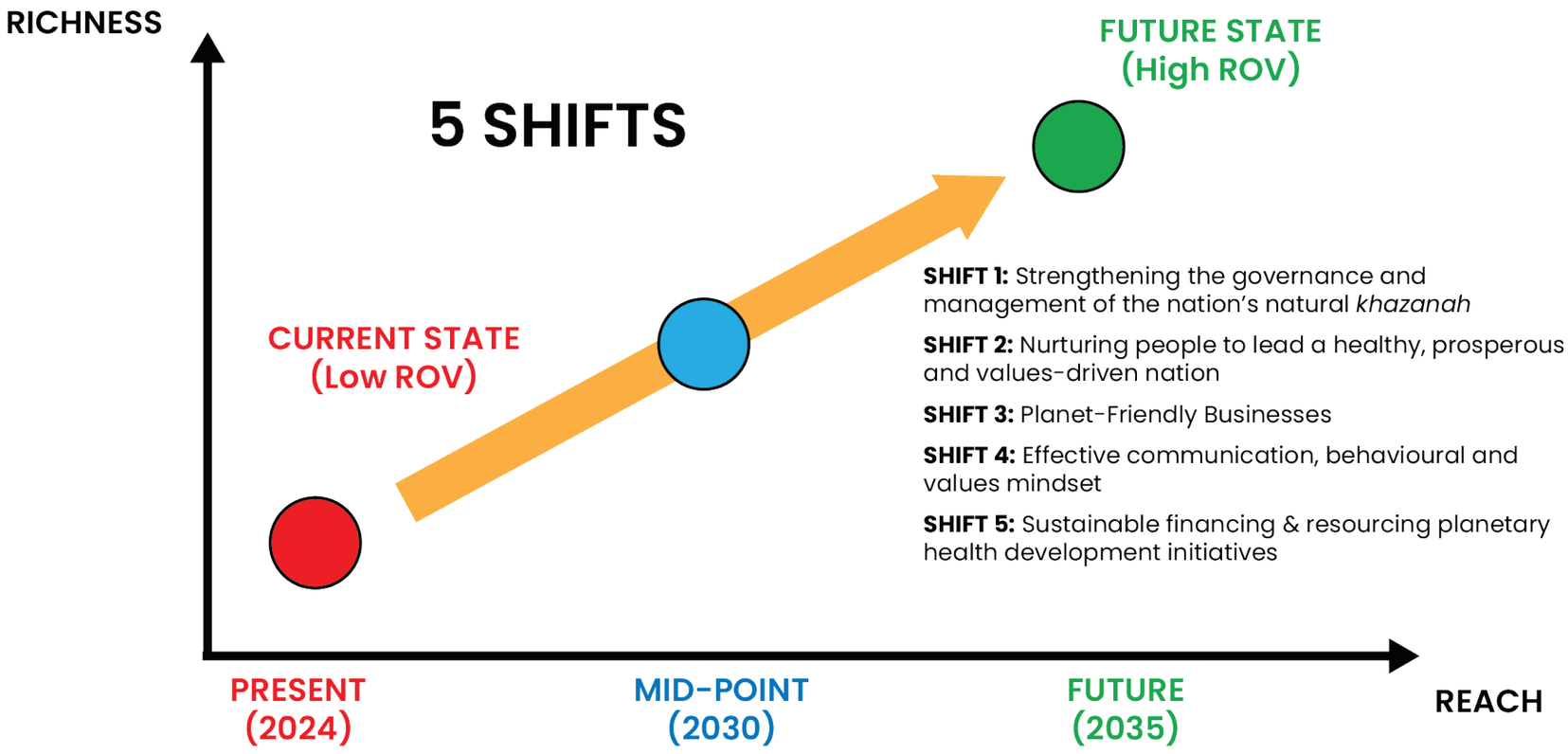


Figure 4-3: Five Systemic Shifts That Raise ROV

4.6 Conclusion: A Thriving Planetary Future for Malaysia

Malaysia stands at a historic turning point. Incremental changes are no longer sufficient. The growing disruptions to planetary systems demand bold, systemic solutions that align human well-being with ecological integrity. The NPHAP provides this vision—a practica roadmap built on a Whole-of-Nation approach that unites governance, education, business and communities.

By adopting integrated development rooted in shared values, Malaysia can shift:

- from exploiting resources to restoring them,
- from maximising profit to pursuing shared purpose,
- from disconnected programmes to coordinated governance.

The future we seek is one where Malaysia's prosperity and sustainability are not in conflict but in harmony. Environmental stewardship must fuel innovation, social cohesion and economic growth.

This plan is more than a policy document. It is a national call to action. Every citizen, every institution and every leader has a role to play in ensuring that our legacy is not one of depletion, but of restoration and renewal. Together, we can build a Malaysia that thrives within planetary boundaries; a resilient, inclusive and values-driven nation for generations to come.

APPENDICES

Appendix 1: Corporate Planetary Health Behavioural Dynamics

This study employs a quantitative approach to assess the current state of planetary health practices among firms in Malaysia. The study was conducted in two phases across a wide range of industries, firms of varying sizes and different regions in Malaysia. The respondents were senior corporate leaders from Malaysia. Data for both phases were collected through a market research company.

Phase 1: Awareness, Importance and Action on Planetary Health Issues

In Phase 1, 714 respondents participated in the survey. This phase focused on understanding the awareness, importance and actions related to planetary health issues by firms in Malaysia. The study also examined the reasons firms do not undertake planetary health business transformations. The data collected in this phase were analysed using descriptive statistics, providing insights into the general perceptions and behaviours related to planetary health. This analysis was done for six pillars identified in the National Planetary Health Action Plan. The six pillars are: Environmental Health; Food and Agriculture; Energy; Communication and Behavioural Change; Education and Research; and Governance.

The analysis is structured around six critical pillars, each addressing different dimensions of planetary health. These pillar-level analyses offer a comprehensive understanding of how businesses and organisations interact with the environment, manage resources and align with sustainable development goals. Each pillar is composed of multiple key issues, identified as critical for assessing a firm's or industry's contribution to planetary health. For each issue identified, the perception of awareness, importance and actions was measured using a Likert scale ranging from 0 to 7. The table below shows the scales used for each of the measures. Firms were also asked for reasons for not undertaking planet-friendly business transformations. Percentages for the reasons for not undertaking planetary-friendly business transformations were measured and ranked.

Appendix Table 1: Legend For Likert Scales

	Awareness	Importance	Actions
0	Not Applicable	Not Applicable	Not Applicable
1	Completely Unaware	Not important and meaningful	No plans to take any action in the foreseeable future (over the next 2 years)
2	Only just became aware	Of little importance and meaningfulness	Some plans are being formulated
3	Slightly aware	Of some importance and meaningfulness	Initiative has been planned, but no action taken yet
4	Moderately aware	Moderately important and meaningful	Initiative has just started (under 1 year)
5	Quite well aware	Quite important and meaningful	Initiative in its early phase of implementation (2-3 years)
6	Well aware	Very important and meaningful	Initiative in mature phase (ongoing for 4-5 years)
7	Fully aware	Critically important and meaningful	Initiative in the mature phase of execution (5-10 years)

The pillar analysis provides valuable insights into the varying degrees of awareness, importance and actions across different domains impacting planetary health. The findings are summarised below.

- **Awareness and Importance versus Action:** Across all pillars, there is a consistent gap between awareness and importance of planetary health issues and taking action to address them. While a substantial proportion of firms acknowledge high awareness and importance of planetary health issues, they do not translate these concerns into tangible actions. A very low proportion of firms transform their business operations to be planet friendly.
- **Barriers to Action:** Among the barriers firms have highlighted is that undertaking planetary health action is beyond the scope of the firm. Some corporate leaders felt that planetary health issues are larger issues; and their actions would not make a difference in resolving the planetary health crisis. They do not see how their business operations or supply chains contribute to breaching planetary boundaries.

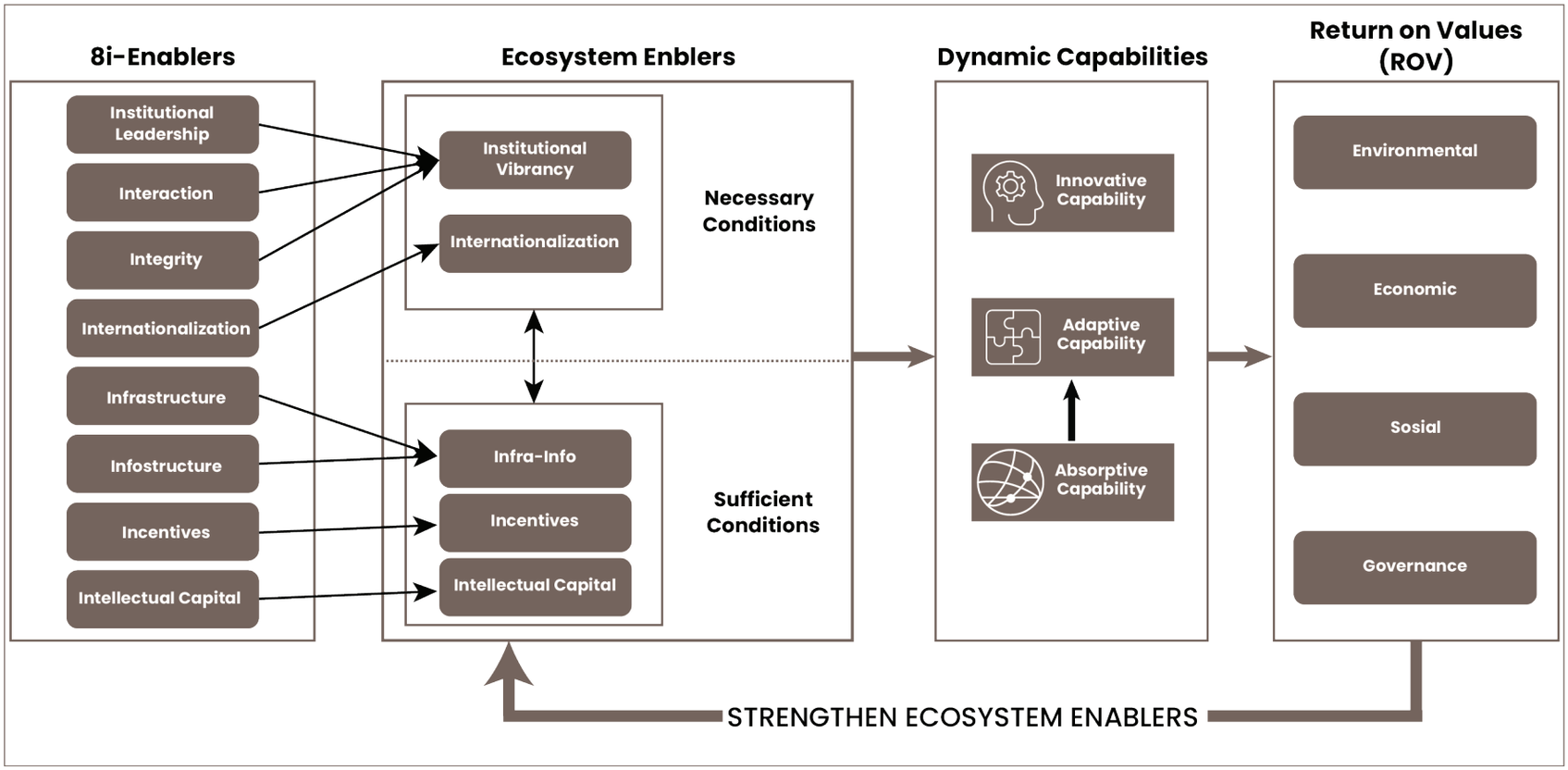
- **The other factors** include high costs of making the transition from current business practices to more planet-friendly practices. Lack of talent in helping firms make the transition towards sustainable practices. These include implementing ESG remains a challenge for most firms.

  Firms also identified time constraints as an important factor hindering them from pursuing planet-friendly business practices. This is attributed to the nature of competitiveness within the industrial ecosystem. Many are of the view that planet-friendly business operations do not contribute immediately to the firm's corporate performance. They are not prepared to allocate time or resources for these sustainable business practices due to scarce resources and competitive nature of the industrial sectors.

  These obstacles are evident in most pillars. These challenges point to the lack of supportive ecosystem enablers that help firms adopt planet-friendly systems and business models. Hence, there is a need for more comprehensive review of the ecosystem enablers to ensure they are supportive for firms to make the transition to sustainable business practices. These support systems include access to financing, adequate supply of talent with sound knowledge in planetary health and ESG and clear governance structures (regulations and incentives) to enable firms to overcome the above-mentioned challenges.

Phase 2: Modelling Complex Firm-level Planetary Health Ecosystem

In Phase 2, 1,315 respondents participated in the survey. The respondents provided feedback on the state of the enablers of the ecosystem, their impact on the dynamic capabilities (absorptive, adaptive and innovative capabilities) of the firms, and how they impact the ROV of the firms. The ROV is characterised across four dimensions: economic, social and environmental dimensions, and governance, stewardship and leadership. The complex planetary health ecosystem was modelled using the 8R-8I Planetary Health STIE ecosystem framework as shown in Appendix Figure 5-1 below. The analysis utilised Structural Equation Modelling to understand the complex inter-relationships among the ecosystem enablers, dynamic capabilities (DC) and ROV generated by firms from different industrial sectors, firm sizes and locations (different regions in Malaysia).



Appendix Figure 5-1: 8R-8I STIE Planetary Health Ecosystem System Value Chain Framework

The findings derived from this analysis using structural equation modelling show that institutional vibrancy is a necessary condition to drive the development of DC components (absorptive, adaptive and innovative capabilities), though its impact varies across states, firm sizes and industries. The summary of the analysis is provided below.

National Level Ecosystem Analysis (Pooled Data):

The national pooled data show that institutional vibrancy strongly influences the other four enablers of the ecosystem and DCs, particularly absorptive and adaptive capabilities, which are essential for building innovative capacity. The enablers and DC also have significant impacts on ROV. This highlights that firms that develop nature-centric innovations and leverage internationalisation (external markets and supply chains) can create greater ROV—economic, environmental and societal value.

1. **Regional Ecosystem Analysis:**

   The regions in Malaysia were classified into four clusters. The study shows that the state of development of the planetary health ecosystems varies across the different regional clusters. Key findings for the regional clusters are given below:

   - **Cluster 1 (Kuala Lumpur, Selangor, Cyberjaya/Putrajaya, Penang):**
     This region aligns closely with the national trends, with strong institutional vibrancy and enablers driving dynamic capabilities and ROV. Firms here are more responsive to sustainability-driven market demands due to their international exposure and access to advanced infrastructure and technology.
   - **Cluster 2 (Johor, Melaka, Negeri Sembilan, Pahang, Perak):**
     The ecosystem is weaker compared to Cluster 1, with limited impact of dynamic capabilities on ROV. Institutional vibrancy supports the enablers of the ecosystem and ROV, but innovation remains a challenge, and firms need to further develop their adaptive and innovative capabilities.
   - **Cluster 3 (Terengganu, Kedah, Perlis, Kelantan):**
     Firms in this category have weaker ecosystem, with minimal contributions from dynamic capabilities to ROV. Institutional vibrancy supports absorptive and adaptive capabilities, but innovative capability does not contribute significantly to value creation. The impact of internationalisation on ROV is also limited.
   - **Cluster 4 (Sabah, Sarawak):** Firms in this region face challenges in developing dynamic capabilities, with talent (intellectual capital) playing a more significant role in driving ROV than innovation. Institutional vibrancy and infrastructure contribute directly to ROV, but the ecosystem remains weaker compared to other regions.

2. **Different Firm Size Ecosystem Analysis:**

   The state of ecosystem analysis was undertaken for firms of different sizes. In this study, we examined three groupings of firm sizes.

   - **Smaller firms (Category 1, with revenue < RM 3 million)**

     Firms in this category place strong reliance on institutional vibrancy to develop enablers and dynamic capabilities, particularly absorptive capability. These firms depend heavily on institutional support (from government agencies, institutions of higher learning and industry associations). Absorptive capability strongly drives ROV, while adaptive and innovative capabilities play a more limited role. Internationalisation impacts absorptive capabilities but has little influence on adaptive and innovative capabilities.

   - **Medium-sized firms (Category 2, revenue RM 3 million to RM 50 million)**

     Firms in this category view institutional vibrancy as crucial for developing dynamic capabilities, with a particular emphasis on adaptive capability. Absorptive and innovative capabilities play a weaker role, but adaptive capability directly influences ROV. Markets and institutional vibrancy remain key drivers for building the required capabilities to align with planetary health initiatives.

   - **Large firms (Category 3, revenue above RM 50 million)**

     Firms in this category show the strongest development of dynamic capabilities across all three dimensions – absorptive,

adaptive and innovative capabilities. Institutional vibrancy and market dynamics significantly drive innovation and ROV for these firms. Internationalisation has a strong impact on both absorptive and innovative capabilities, allowing these firms to capitalise on global market trends. These firms are well-positioned to develop and utilise enablers to support planetary health initiatives, with absorptive and innovative capabilities directly contributing to ROV.

3. **Industry Type Ecosystem Analysis:**
   The results show significant variability in how institutional vibrancy and enablers influence DCs and ROV for the different industrial sectors.

   - **Manufacturing:**
     Institutional vibrancy has a strong impact on absorptive and adaptive capabilities, leading to innovative capabilities and ROV. External markets and supply chains are crucial for building ecosystem enablers. As firms move up the innovation value chain, they create greater nature-friendly ROV.
   - **Services:**
     The largest sector in the economy, services, relies on absorptive and adaptive capabilities for ROV generation. Institutional vibrancy and internationalisation strongly influence these capabilities, though the sector primarily uses, rather than creates new technology.
   - **Construction and Real Estate:**
     Strong institutional vibrancy and incentives are key drivers of absorptive and adaptive capabilities, which are essential for ROV. Innovative capability plays a weak role. Incentives are crucial for acquiring technology and building capabilities aligned with planetary health.
   - **Supply Chain:**
     This sector is increasingly tech-driven, relying on institutional vibrancy to strengthen absorptive and innovative capabilities. ROV is closely tied to the dynamic capability value chain and international markets.
   - **Information Technology (IT):**
     The IT sector sees strong institutional vibrancy but limited development of dynamic capabilities. Absorptive capability is linked to infra-info development, but innovative capability has limited influence on ROV. Internationalisation supports innovation but has little impact on adaptive capability.
   - **Finance:**
     Institutional vibrancy is vital for infra-info and incentives, with absorptive and innovative capabilities moderately influencing ROV. Internationalisation supports innovation but has little impact on adaptive capability.
   - **Professional Services**:
     Institutional vibrancy is the main driver for ROV, with limited contributions from dynamic capabilities. This sector's ROV is primarily reliant on external markets and institutional frameworks rather than internal innovation.

   These findings highlight the varied roles that institutional vibrancy, ecosystem enablers and dynamic capabilities play across industries, particularly in supporting ROV aligned with planetary health initiatives. Each industry has different strengths and weaknesses in developing and utilizing dynamic capabilities, influenced heavily by external market demands and internal capabilities.

Summary:
The analysis in Phase 1 and Phase 2 shows that the development of the planetary health ecosystems varies among firms of different sizes, regions and sectors. These insights suggest that planetary health strategies should not be "one-size fits all" for the corporate sector in Malaysia. Specific policies, strategies and programmes should be developed for firms with different characteristics (size and industry type) and located in different the four regions in the country.

For more detailed analysis of the firm-level survey, please refer to the full report listed below.

Nair, M. S., Ahmed, P. K., Vaithilingam, S., Teow, H. H., Mahalingam, S., 2024. Corporate Planetary Health Behavioural Dynamics., Sunway Institute for Global Strategy and Competitiveness, Sunway University and Academy of Sciences Malaysia.

Appendix 2: Malaysian Public Awareness, Concerns, Behaviours and Communication Preferences on Planetary Health: A Survey of Advance Policy Directions

This study presents the findings of the first national survey on public perceptions of planetary health in Malaysia. The survey aimed to assess Malaysians' awareness and beliefs about planetary health, consumption habits related to improving planetary health and communication patterns influencing these behaviours.

Awareness of Planetary Health: Awareness of planetary health in Malaysia is reasonably high, with 58 percent of respondents stating they had heard of the concept. This level of awareness is consistent across states and regions, though it is highest in Borneo, where 64 percent of respondents reported awareness. Educational attainment plays a significant role in awareness levels; 68 percent of those with postgraduate degrees are familiar with planetary health. However, this group constituted a small proportion of the survey sample, indicating that educational outreach could be a key area for improvement.

Concern about Planetary Health: A significant proportion of Malaysians expressed concern regarding planetary health issues, with 82 percent of respondents indicating worry about the potential impacts on their lives. This concern extended to their families, as reflected by 85 percent of respondents who reported similar anxieties for their loved ones. Specific issues of concern included extreme weather events, such as floods and heat waves, which disproportionately affect various states in Malaysia. Approximately 25-29 percent of respondents reported being "extremely concerned," while 38-40 percent described themselves as "very concerned," underscoring the urgency of addressing these environmental challenges.

Confidence in Science and Technology: Respondents demonstrated a notable level of confidence in science, technology and innovation (STI) as effective tools to address planetary health challenges. Over 60 percent of respondents identified renewable energy technologies and sustainable agricultural practices as having the greatest potential to enhance planetary health. Furthermore, respondents emphasised the importance of transitioning away from fossil fuels, provided such transitions are conducted equitably. Food security was also highlighted as a critical area of concern, given its direct impact on the cost of living, reflecting the interconnected nature of environmental and economic stability.

Information Sources and Trust: The internet emerged as the primary source of information on planetary health, utilised by 79 percent of respondents, followed by television (67 percent) and friends and family (49 percent). However, trust in these sources varied significantly. Online media, journalists and social connections were perceived as less reliable sources of information. Conversely, religious groups were regarded as more trustworthy, particularly among respondents from the East Coast region. These findings suggest that culturally sensitive and community-oriented strategies may enhance public trust and engagement.

Correlation Between Concern and Behaviour: A strong correlation was observed between concern for planetary health and the adoption of pro-environmental behaviours. Across all income groups, increased concern was associated with actions such as supporting local food producers, reducing food waste and switching to environmentally friendly products. Additionally, respondents commonly engaged in energy-saving practices such as turning off electrical appliances when not in use.

However, it is noteworthy that financial motivations underpin these behaviours, indicating that cost saving, rather than environmental awareness, may be the primary driver. A minority of respondents (approximately 20 percent) actively disseminated information on sustainability within their communities and implemented measures to mitigate planetary health issues. Despite this, only 18-35 percent of respondents consistently made financial, and/ or lifestyle sacrifices to support climate-friendly policies, reflecting the need for systemic changes to complement individual efforts.

Barriers to Engagement: Financial constraints and limited government support were identified as significant barriers to engaging in behaviours that promote planetary health. Respondents were more likely to adopt cost-effective measures, such as purchasing locally produced food or recycling, which require minimal infrastructure. In contrast, there was lower engagement in costlier practices, such as installing solar panels or purchasing sustainable products, even among those with higher income levels.

Gaps Between Awareness and Action: Although awareness of planetary health is relatively high, many respondents cited a lack of knowledge as a barrier to adopting sustainable lifestyles. While respondents were familiar with the concept of planetary health, they often expressed uncertainty about the perceived efficacy of individual action compared to systemic changes. Most respondents believed that political and social institutions should assume primary responsibility for addressing planetary health challenges, highlighting the need for public education initiatives and systemic reforms to bridge the gap between awareness and action.

For more detail analysis of the survey, please refer to the full report listed below.

Ooi, W. L., Azhari, A, Pandya-Wood-R and Johns-Putra A, 2024. Malaysian public awareness, concerns, behaviours and communication preferences on planetary health: A survey to advance policy direction., Monash Climate Change Communication Research Hub, Malaysia node, Monash University Malaysia.

Appendix 3: NPHAP Pillars Key Indicators for Impact Tracking Monitoring

The impact tracking and monitoring framework aims to align with the NPHAP, considering both short-term actions that deliver early progress and long-term goals that reflect Malaysia's long-term broader planetary health vision. This dual focus enables targeted responses to immediate need while guiding sustained, systemic improvement over time.

The key indicators presented under the six NPHAP pillars are not a mandatory checklist. Rather they form a flexible menu of prioritised measures that can be used selectively, based on relevance to specific contexts, data availability, and alignment with national and subnational priorities. Their selection reflects a balance between the urgency of environmental and health challenges, feasibility of data collection, and potential to demonstrate meaningful progress. (Appendix Table 5-1 – NPHAP Indicator Menu).

To effectively measure the performance and strengthen results accuracy, it is important to map these indicators against historical baseline data that is specific to Malaysia. Relevant reference sources include the Science Outlook (2017, 2019 and 2020) by the Academy of Sciences Malaysia, the Planetary Boundaries Framework developed by the Stockholm Resilience Centre and the Sustainability Society Index.

Appendix Table 5-1 – NPHAP Indicator Menu

Pillars	Focus Area	Key Indicators
Governance	Education	1. Number of education, training and CEPAA programmes that integrate behavioural science and promote pro-planetary health behaviours 2. Proportion of education and training programmes assessed as effective in achieving planetary health learning outcomes 3. Number of toolkits made available to businesses to support implementation of planetary health-aligned practices
	Awareness	1. Percentage of policymakers, industry leaders and the public who recognise planetary health as a national security priority (based on regular perception surveys) 2. Proportion of surveyed stakeholders demonstrating awareness of planetary health, ESG and SDG initiatives 3. Number and percentage of government agencies participating in training and leadership programmes on planetary health, with documented changes in perception and practice 4. Operational status and usage analytics of a national real-time dashboard tracking behavioural shifts towards planetary health in response to new funding and support interventions
	Practices	1. Level of data access and transparency, measured by the availability and usability of publicly accessible planetary health datasets 2. Proportion of businesses adopting and implementing green procurement standards in line with planetary health principles
	Laws and Regulations	1. Number of laws, enactments, ordinances and policies formally aligned with recognised planetary health best practices and standards
	Support to Business	1. Amount of investment directed towards supporting local actors through targeted planetary health communication strategies 2. Number of operational resource centres established to support local ecosystems and stakeholders 3. Number of firms and organisations accessing planetary health-related services, and evidence of outcomes achieved (e.g. compliance, innovation, behavioural change)
	Funding	1. Total amount of funding secured for planetary health development initiatives 2. Total amount of funds allocated and disbursed to states and districts for planetary health-related development initiatives 3. Value and implementation status of ecological fiscal transfers supporting planetary health objectives

Pillars	Focus Area	Key Indicators
Energy Transition	Renewable Energy Deployment	1. Installed renewable energy capacity by state and source (solar, wind, hydrogen, SMR, biomass) 2. Percentage of national electricity mix from renewable sources 3. Volume of renewable electricity generated annually 4. Number of solar PV systems installed in residential areas 5. Number of renewable energy–powered residential communities receiving subsidies
	Electrification and Green Transport	1. Total number of registered electric vehicles (cars, buses) and share of new vehicle sales 2. Number and geographic distribution of EV charging stations 3. Average EV range and battery storage capacity by model 4. Total number of green public transport vehicles (buses, MRT, LRT, e-hailing) 5. Malaysia's contribution to global electric vehicle stock
	Energy Efficiency and Demand	1. Electricity consumption per capita and by sector 2. National energy intensity (energy per unit GDP) 3. Energy efficiency performance index (based on building, transport, industry standards)
	Investment, Programmes and Capacity Building	1. Total public and private investment in renewable energy technologies and infrastructure 2. Number of funding schemes, grants, training programmes and awards for renewable energy R&D and deployment 3. Number of universities and schools with renewable energy content in curricula or dedicated courses/modules 4. Number of digital platforms providing renewable energy education and public engagement
	Just Transition and Affordability	1. Change in levelised cost of electricity (LCOE) for solar and other renewable systems 2. Number of subsidies or financing mechanisms to lower installation costs for households 3. Number of documented transition stories (including Indigenous communities) highlighting social outcomes
	Policy and Systemic Shifts	1. Progress towards national target of 70 percent renewable capacity and complete coal phase-out by 2050 2. Percentage of energy mix indicating carbon emissions reduction and improvements in energy intensity 3. Level of private sector investment in new energy sources as a share of total investment in energy infrastructure 4. Number of public engagements by policymakers focused on renewable energy transition
	Large Scale Solar (LSS)	1. Number of Large-Scale Solar power stations (LSC) with energy storage capacity 2. Amount of installed capacity of LSC
	Biorefinery	1. Increase in biorefinery capacity to a target of 3.5 billion litres by 2050 2. Increase in biomass and biogas power generation capacity towards a target of 1.4 gigawatts (GW) by 2050
	Hydrogen	1. Proportion of grey hydrogen (produced from fossil fuel reforming) in national hydrogen supply (reduced to zero by 2050)
	Carbon footprint	1. Method of carbon footprint calculation

Pillars	Focus Area	Key Indicators
	Fossil Fuel Use and Dependency	1. Annual volume of coal and fossil fuel consumption in Malaysia 2. Total energy produced from fossil fuel combustion (2014–2023) 3. Percentage of national energy use derived from fossil fuels, relative to renewables
	Energy Access and Equity	1. Number and percentage of rural households in Sarawak without access to electricity
	Environmental and Health Impacts	1. Ambient air quality levels, measured by concentrations of PM2.5, NO_2, SO_2, CO, ozone and volatile organic compounds 2. Prevalence of household solid fuel use and associated indoor air pollution risks 3. Vehicle emissions contribution to urban air pollution and carbon output 4. Total national greenhouse gas emissions, including methane and CO_2 5. Estimated national carbon footprint per capita and by sector 6. Incidence rates of respiratory and cardiovascular diseases linked to air pollution and fossil fuel use
	Public and Institutional Awareness	1. Percentage of policymakers and industry actors aware of international laws regulating fossil fuel use (survey-based) 2. Public and industry perceptions of fossil fuel versus renewable energy use, measured through regular surveys
	Economic Impact	1. Malaysia's fossil fuel revenue trends, including post–sea pollution events
	Climate Change Policy	1. Annual greenhouse gas intensity growth rate (emissions per unit GDP) 2. Availability and uptake of tax rebates or fiscal incentives for electric vehicle adoption 3. Official national commitment to net zero emissions and progress towards interim milestones
	Energy Policy	1. Existence and implementation status of the National Energy Policy 2022–2040 2. Existence and implementation status of the National Energy Transition Roadmap 3. Existence and implementation status of the Hydrogen Economy and Technology Roadmap 4. Number of environmental laws and regulations revised or adopted to support the energy transition 5. Progress against targets set out in the National Energy Transition Roadmap 6. Number of energy transition policy recommendations formally adopted by relevant authorities 7. Existence of policies guiding land use for energy projects in remote or underserved areas
	Incentive / Budget Allocation	1. Total annual budget allocation for energy transition initiatives 2. Proportion of allocated budget disbursed annually (realised vs. planned) 3. Annual R&D budget for clean energy technologies and data infrastructure 4. Value of funding allocated to develop clean energy training modules and reskilling programmes 5. Annual expenditure on communication strategies to support energy transition awareness and adoption 6. Number and total value of incentives, subsidies and tax exemptions provided for renewable energy technologies (e.g. solar, CCS, EVs) 7. Number and total value of funding schemes targeted at Indigenous and marginalised communities for energy transition participation (including trust funds) 8. Number and value of funding and financing instruments created to support private sector engagement in energy transition 9. Budget allocated to support the dissemination of Indigenous knowledge relevant to the energy transition

Pillars	Focus Area	Key Indicators
	Planetary Health in Business	1. Number of publicly available annual reports disclosing Environmental and Social Impact Assessments (EIA, SIA) for energy projects 2. Number of SMEs securing green financing, based on annual business survey data 3. Number of completed flagship projects demonstrating planetary health-aligned innovation or impact 4. Number of community-led planetary health projects implemented by NGOs or grassroots organisations 5. Number of business engagement sessions held annually, and percentage of companies in each sector participating 6. Number of businesses in compliance with planetary health-linked sin tax regulations 7. Number of businesses meeting planetary health targets under ESG frameworks 8. Number of ESG frameworks that explicitly integrate planetary health principles) 9. Number of formal collaborations between businesses and academic institutions on planetary health topics 10. Number of operational business hubs established for R&D and innovation in planetary health-related fields 11. Number of businesses with official planetary health certification, and year-on-year growth in certifications 12. Existence and number of published planetary health business guidelines 13. Existence of a national platform for business sector knowledge-sharing on planetary health implementation 14. Number of businesses holding dual or triple certifications in PH, ESG and Halal standards 15. Proportion of businesses publicly disclosing planetary health-related information in annual reports and websites 16. Number of companies receiving government or donor incentives to support planetary health adoption 17. Number of businesses using toolkits to develop energy transition plans, and documented changes in awareness and practice based on training participation and perception surveys
	Media Coverage and Public Engagement	1. Number of media articles, interviews, and features on planetary health in traditional and digital media 2. Social media engagement metrics, including likes, shares, comments, and followers on planetary health-related accounts 3. Number of community or town areas with operational digital boards promoting planetary health awareness 4. Number of active social media accounts focused on planetary health outreach 5. Number of communication activities conducted annually (e.g. public events, campaigns, infographics, videos, training sessions) 6. Number of energy transition programmes communicated through national or local platforms
	Digital and Monitoring Systems	1. Usage analytics of planetary health digital platforms (page views, user interactions, membership growth) 2. Public feedback and satisfaction with digital communications (e.g. survey responses, usability reviews) 3. Existence and functionality of a state-level monitoring system integrated into the federal reporting database 4. Number of planetary health indicators published annually by DOSM (e.g. via infographics or dashboards) 5. Existence of a national, centralised repository for sector-specific planetary health data 6. Number of student and public assessments conducted to track understanding and engagement with planetary health content

Pillars	Focus Area	Key Indicators
	Institutional Structures and Strategy	1. Existence and activity of a national taskforce dedicated to planetary health communications 2. Number of departments or agencies formally assigned responsibility for planetary health communication 3. PH strategy implementation progress as tracked and reported by the Energy Council or equivalent governance body 4. Publication of national reference materials and best practice guidelines on planetary health communication 5. Incorporation of planetary health into ESG and SDG frameworks across sectors 6. Formation of a Consortium for New Energy Resources and its activity in PH-aligned innovation and reporting
	Capacity Building and Curriculum Development	1. Number of planetary health-related publications and patents produced nationally 2. Number of planetary health communication tools (e.g. toolkits, training guides) developed and disseminated 3. Introduction of planetary health as a recognised domain within the Malaysia Qualifications Agency (MQA) for programme development 4. Number of pilot programmes evaluated through feedback mechanisms to improve communication design
	Stakeholder Engagement and Social Outcomes	1. Number of stakeholder meetings, presentations, and partnerships formed through communication efforts 2. Number of commercial projects communicating energy transition outcomes, with documented stakeholder feedback 3. Socioeconomic trends tracked in relation to planetary health initiatives (e.g. job access, education, social uplift) 4. Correlation of environmental data and public health outcomes with completeness and accuracy of national reporting systems 5. Existence of dedicated agencies for advancing rights-based approaches in planetary health reporting
	Energy supply	1. Number and diversity of industry players actively participating in national and subnational energy supply planning processes
	Electricity	1. Reduction in the levelised cost of electricity (LCOE) over time, disaggregated by energy source 2. Percentage of households in Indigenous communities with access to electricity (electrification rate)
	Green vehicle	1. Total number of green public transport vehicles in operation, including MRT, LRT, buses, taxis and e-hailing fleets
	Awareness	1. Number of forums, conferences and public dialogues conducted on planetary health across all thematic pillars 2. Number of annual seminars and industry engagement sessions focused on planetary health and sustainability 3. Number of community- and state-level dialogue sessions on planetary health and the energy transition 4. Number of public engagements, media reports and outreach campaigns highlighting the economic benefits of the energy transition 5. Number of outreach programmes delivered via traditional and online media platforms 6. Number of public advertisements or media programmes on planetary health and energy transition topics 7. Number of towns or communities equipped with digital boards promoting planetary health awareness 8. Number of activities led by NGOs to promote planetary health awareness and action

Pillars	Focus Area	Key Indicators
		9. Number of sustainability initiatives involving parents, community members or grassroots groups 10. Number of community-driven planetary health projects implemented annually 11. Number of operational learning centres focused on planetary health education and awareness 12. Number of national participations in global planetary health initiatives and adoptions of international standards
	Education	1. Number of educational materials distributed and social media campaign reach (impressions, shares, likes), with feedback from target audience surveys 2. Number of education and training assessments conducted to evaluate planetary health learning outcomes 3. Number and percentage of schools nationwide implementing the planetary health curriculum 4. Number of teachers trained in planetary health education 5. Number of students enrolled in higher education programmes and careers related to sustainability and planetary health 6. Number of advanced planetary health courses and enrolment rates 7. Number of planetary health-related extracurricular activities conducted and level of student participation 8. Extent of planetary health integration across primary, secondary and tertiary curricula 9. Number of school and university syllabuses/modules incorporating planetary health and energy transition topics 10. Student understanding and engagement levels, measured through periodic surveys and assessments
	Perception Survey	1. Public understanding of Carbon Capture, Utilisation and Storage (CCUS), measured through regular perception surveys or polls 2. Frequency and coverage of periodic public opinion surveys on planetary health and related topics 3. Regular national assessment of public awareness, attitudes and behaviours related to planetary health
	Indigenous Community	1. Number of documented engagement activities sharing success stories from Indigenous communities (including baseline studies) 2. Level of Indigenous visibility in public planetary health communication campaigns 3. Number of Indigenous communities actively involved in planetary health initiatives 4. Existence and application of national guidelines for Indigenous land use in energy projects 5. Degree of Indigenous and NGO participation in energy and planetary health decision-making processes (e.g. representation in advisory bodies or consultations)
	Planetary Health	1. Availability of sector-specific guidelines on planetary health best practices for major industry sub-sectors 2. Number of national and sectoral policies that incorporate planetary health principles 3. Existence of a legal framework or reference tool to guide interpretation of legal norms related to planetary health

Pillars	Focus Area	Key Indicators
Environment and Health	Biodiversity	1. Area and percentage of terrestrial biomes under formal protection 2. Area and percentage of marine ecosystems designated as marine protected areas (MPAs) 3. Score on the Protected Areas Representativeness Index (PARI) 4. Score on the Biodiversity Habitat Index (BHI) 5. Score on the Species Protection Index (SPI) 6. Score on the Species Habitat Index (SHI)
	Ecosystem Services	1. Annual rate and total area of tree cover loss 2. Annual rate and total area of wetland loss
	Fisheries	1. Status of national fish stocks, assessed by proportion classified as overexploited, fully exploited or sustainably managed 2. Score on the Marine Trophic Index, reflecting the average trophic level of fish catches
	Acidification	1. Annual growth rate of sulphur dioxide (SO2) emissions 2. Annual growth rate of nitrogen oxides (NOx) emissions
	Agriculture	1. Extent of sustainable pesticide use, measured by compliance with national or international safety standards 2. Score on the Sustainable Nitrogen Management Index (SNMI)
	Air Quality	1. Population exposure levels to ground-level ozone (O3) 2. Population exposure levels to nitrogen oxides (NOX) 3. Population exposure levels to sulphur dioxide (SO2) 4. Population exposure levels to carbon monoxide (CO) and carbon dioxide (CO2) 5. Population exposure levels to volatile organic compounds (VOCs)
	Water Resources	1. Percentage of wastewater that is safely treated before discharge, in compliance with national standards
	Drinking water	1. Percentage of population exposed to unsafe drinking water sources 2. Percentage of population using at least basic drinking water services 3. Percentage of population using at least basic sanitation services 4. Number of confirmed COVID-19 cases, disaggregated by age group, state and vaccination status
	Waste Management	1. Percentage of solid waste that is collected and managed through controlled or sanitary disposal methods 2. Volume of plastic waste entering the ocean from land-based sources (tonnes per year)
	Climate Change Policy	1. Annual growth rate of greenhouse gas (GHG) emissions intensity, measured as emissions per unit of GDP
	Health Financing	1. Total current health expenditure as a percentage of GDP 2. Domestic general government health expenditure as a share of total health spending 3. Number and percentage of people pushed below or further beneath the poverty line due to health-related costs
	Infectious Disease	1. Diarrhoea Treatment coverage rate for diarrhoeal diseases among children 2. Incidence rate of malaria (cases per 1,000 population) 3. Incidence rate of tuberculosis (cases per 100,000 population) 4. Treatment coverage rate for acute respiratory infections (ARI) among children

Pillars	Focus Area	Key Indicators
	Environment-linked communicable and non-communicable diseases	1. Percentage of total deaths attributable to specific diseases (e.g. NCDs, air pollution-related conditions) 2. Disease-specific mortality as a percentage of the total population 3. Overall mortality rate per 1,000 population, disaggregated by cause where possible
	Nutrition	1. Completeness of death registration with cause of death information 2. Consumption of iodised salt 3. Low birthweight babies 4. Number of undernourished 5. Prevalence of anaemia/ overweight/underweight
Sustainable Food	Food affordability	1. Average household food expenditure as a proportion of total income 2. Average cost of a healthy diet meeting national dietary guidelines 3. Availability of fruits and vegetables per capita (kg/year or market supply data) 4. Retail market value of ultra-processed food products as a percentage of total food sales 5. Percentage of the population with access to safely managed drinking water services 6. Prevalence of undernourishment in the population
	Food Security	1. Percentage of the population experiencing moderate or severe food insecurity 2. Percentage of the population unable to afford a healthy diet 3. Percentage of women, infants and young children meeting minimum dietary diversity standards 4. Proportion of population regularly consuming all five key food groups: fruits, vegetables, grains, protein foods and dairy
	Diet Quality	1. Percentage of population reporting zero consumption of fruits and vegetables 2. Per capita consumption of sugar-sweetened beverages 3. Composite risk score for noncommunicable diseases (NCDs), based on dietary and lifestyle factors
	Greenhouse Gas Emissions	1. Carbon dioxide emissions per kilogram of pulses produced (kg CO_2/kg product) 2. Carbon dioxide emissions per kilogram of poultry and beef produced 3. Methane and carbon dioxide emissions associated with rice cultivation (per hectare or per kg produced)
	Food Production	1. Annual national production volume of pulses (metric tonnes) 2. Annual national production volume of fruit (metric tonnes) 3. Annual national production volume of poultry and beef (metric tonnes) 4. Annual national production volume of vegetables (metric tonnes)
	Land Use	1. Annual rate and total area of cropland expansion, including conversion of natural ecosystems
	Water	1. Agricultural water withdrawal as a percentage of total renewable water resources
	Biosphere Integrity	1. Percentage of agricultural land maintaining minimum levels of natural habitat to support functional ecosystem integrity 2. Fishery health score based on national or global index progress metrics
	Pollution	1. Quantity of pesticides applied per hectare of cropland 2. Score on the Sustainable Nitrogen Management Index (SNMI), reflecting efficiency and environmental impact of nitrogen use
	Poverty and Income	1. Gross Domestic Product (GDP) and Gross National Income (GNI) per capita, adjusted for purchasing power parity (PPP)

Pillars	Focus Area	Key Indicators
	Employment	1. Unemployment rate, disaggregated by urban and rural areas 2. Underemployment rate, disaggregated by urban and rural areas
	Social Protection (Social Safety Net)	1. Coverage (percentage of population)
	Resilience	1. Index of food price volatility over time 2. Variability in national food supply (year-on-year change in availability or imports) 3. Adequacy of food-related welfare support, measured as percentage of population covered by assistance schemes
	Governance/ Compliance	1. Compliance rate with sustainable agrifood system practices and national food safety standards 2. Frequency and coverage of regulatory inspections and audits, and level of stakeholder awareness and participation 3. Number of reported food contamination incidents linked to chemical pollution and microplastics 4. Adoption rate of planetary health and ESG best practices across the agrifood sector
	Human Capital/Talent	1. Number of PH educational programmes, workshops, seminars and awareness campaigns targeted at different stakeholders, including farmers, producers, consumers and policymakers. 2. Number of documented case studies and success stories that demonstrate the positive impact of the awareness and education strategies 3. Number of successful cross sector collaborations among industry, GLCs, government agencies, universities and research institutions
	Business operations	1. Number of employees trained in sustainability and environmental management across business sectors 2. Volume of resource consumption (water, energy, raw materials) per business or per unit of output 3. Amount of financial savings or efficiency gains resulting from adoption of sustainable business practices 4. Percentage of annual business budget allocated to planetary health-related initiatives 5. Measured Social Return on Investment (SROI) from sustainability and planetary health programmes 6. Number of businesses adopting planetary health best practices and meeting ESG compliance requirements
	Communication	1. Number of food producers adopting new technologies over time 2. Number of youth actively engaged in food production activities or enterprises 3. Average financial return or payback period for farmers adopting sustainable or innovative technologies
	Financing	1. 1. Number of government-linked companies (GLCs) involved in sustainable food systems, and total value of financing and technology deployed 2. Total investment committed to sustainable food production projects (public and private sources) 3. Volume of carbon credits generated or traded through sustainable agriculture and food production practices 4. Number of farmers and agribusinesses accessing new financial products and services (e.g. loans, grants, subsidies) 5. Financial returns from investments in sustainable food production and number of new insurance products introduced to support sector resilience

Pillars	Focus Area	Key Indicators
Research and Education	Higher learning	1. Volume of research and innovation outputs on planetary health, including thematic contributions in: • Environmental media (air, water, solid waste) • Water security and quality • Biodiversity and ecosystem health • Energy systems and transitions • Sustainable food systems • Healthcare and planetary health • Plantation and commodity crop sustainability 2. Number of PhD research programmes focused on planetary health, SDGs and ESG themes 3. Number of industry-sponsored PhD programmes in planetary health fields 4. Number of postgraduate students enrolled in planetary health, SDGs and ESG-related disciplines 5. Number of postgraduate research students trained with demonstrable industry-readiness 6. Number of graduates employed in planetary health-related industries or roles requiring PH-relevant skills 7. Number and total value of local patents and intellectual property (IP) in planetary health domains that have been commercialised
	Professional programmes	1. Number of teachers, trainers and students trained in planetary health, sustainability, or ESG-related fields 2. Number of professional courses on planetary health offered by ministries, government agencies, NGOs, professional bodies and industry associations 3. Number of workshops, training sessions, platforms and forums conducted to advance planetary health knowledge and skills
	Schools	1. Number of curriculum and co-curriculum activities in schools that incorporate planetary health themes and competencies
	Industry/ public research and higher learning	1. Number of local and international R&D partnerships between institutions of higher learning (IHLs), public research institutes (PRIs) and industry players focused on planetary health 2. Total value of R&D investment channelled into Malaysia's Research, Development, Innovation, Commercialisation and Entrepreneurship (RDICE) ecosystem
	Government	1. Total government expenditure on planetary health-related R&D, including commercialisation of local innovations within the RDICE ecosystem
	Corporate	1. Total corporate investment in planetary health-related R&D and commercialisation of innovations within the local RDICE ecosystem 2. Number of training firms, corporate leaders and workforce members trained in planetary health, SDG and ESG-related competencies 3. Percentage of companies reporting planetary health-related awareness and actions in their annual reports
	Industry	1. Number of local start-ups operating in planetary health-related sectors, and number of firms adopting locally developed innovations
	Public and society	1. Number and scope of circular economy practices adopted at community and institutional levels 2. Number of CEPA (Communication, Education and Public Awareness) advocacy activities related to waste management, recycling and sustainable practices 3. Level of awareness of planetary health-related R&D among researchers, students and education/training professionals (measured through targeted surveys)

Pillars	Focus Area	Key Indicators
		4. Level of adoption of planetary health-related behaviours, technologies and systems, and perceived impacts on users and stakeholders (via perception surveys) 5. Number of open and accessible platforms and forums used to communicate R&D policies, education programmes, incentives and support systems to the public 6. Observable social and behavioural change aligned with planetary health values, measured as Return on Value (ROV) 7. Number of research outreach programmes delivered via traditional and digital platforms 8. Number of broader outreach initiatives promoting planetary health through various media and engagement strategies 9. Public awareness levels, as measured through surveys and participation in CEPAA and training programmes 10. Changes in public perception and behaviour on planetary health issues across diverse communities and regions 11. Degree of integration of planetary health, SDG and ESG principles in education and training programmes
Values, Cultural Shift and Behavioural Changes of Society and Communication	Awareness	1. Number of open and transparent platforms and forums promoting public dialogue on planetary health 2. Number of communication toolkits on planetary health distributed and actively used by target audiences 3. Public awareness levels on planetary health, measured through perception surveys and social media analytics 4. Participation rates in public awareness campaigns and planetary health education programmes 5. Availability and utilisation of real-time dashboards tracking behavioural changes related to planetary health 6. Observed changes in public behaviour linked to the adoption of sustainable practices
	Reporting on planetary health	1. Number of planetary health-related programmes and news stories produced and aired across traditional and digital media 2. Audience reach and engagement metrics for planetary health content (e.g. views, shares, comments) 3. Qualitative feedback from journalists and editors on the effectiveness of planetary health training sessions 4. Number of awards and recognitions received for excellence in planetary health journalism
	Development initiatives	1. Number of urban planning projects that integrate planetary health principles into design and implementation 2. Total amount of R&D funding allocated and utilised for planetary health-related initiatives 3. Documented outcomes of research initiatives applied in sustainable development projects or policies 4. Total funding disbursed to states and districts for building and strengthening planetary health communication ecosystems 5. Environmental and public health performance metrics tracked in newly developed or urbanised areas
	Planetary health in business	1. Number of companies incorporating planetary health principles into their ESG frameworks and reporting 2. Qualitative and quantitative feedback from businesses on the usefulness of planetary health guidelines and support tools 3. Documented changes in business practices that contribute to improved environmental and public health outcomes 4. Number of planetary health toolkits developed and distributed for business use 5. Level of business awareness of planetary health, ESG and SDG initiatives, measured through perception surveys 6. Participation rates of businesses in training and leadership programmes, and documented shifts in perception and practice 7. Number of industry recognitions or certifications awarded for integrating planetary health into business operations

Appendix 4: Examples of Genomic Database (Local and International)

Appendix Table 5-2: Local Genomic Database (non-exhaustive)

Database	Lead Agency/ Developer	Year Established	Purpose/Aims	Key Features
Malaysia Biodiversity Information System (MyBIS)	NRES	2015	One-stop central biodiversity information repository	— Integrates multiple sources from experts, publications, and specimen databases — Includes: • Sabah Biodiversity Integrated Information System (SaBIIS) • Botanical Research Herbarium Management System (BRAHMS)
Genomsawit Portal Malaysian Oil Palm Genome Programme (MyOPGP)	Malaysian Palm Oil Board (MPOB)	Initiated in 2014	Share oil palm genome, transcriptome, and marker data	— Developed under the Malaysian Oil Palm Genome Programme (MyOPGP) — Provides access to MPOB-OPGP data and specialised genome databases and tools
MyGeoBiod	Ministry of Natural Resources and Environment (NRE)		Centralised geospatial biodiversity data system	— Collects flora and fauna data through backend processing — Supports internet-based geographic database of surveyed samples and distributions
Bioresources Database	National Institutes of Biotechnology Malaysia (NIBM)		Host and provide access to various bioresource datasets	— Mynature 50,000 plant samples — Human genome database (26 ethnic groups) — Genome computing centre — Genomic biobank
AgrobIS information system	Malaysian Agricultural Research and Development Institute (MARDI)	Started in 2006, upgraded as web-based in 2007	Public access to MARDI-conserved biological genetic resources	— Supports agricultural R&D through access to genetic data
Malaysia Traditional Knowledge Digital Library (MyTDKL)	Intellectual Property Corporation of Malaysia (MyIPO)	Started in 2009	Digital repository of traditional knowledge and genetic resources	— Protects and documents traditional knowledge in digital format
Systematic Marine Biodiversity Information System (SyMBiosIS)			Assessment and monitoring of marine biodiversity and ecosystem health	— Supports marine conservation through systematic data collection
Marine Park and Resource Management			National fishery resource management based on science and governance	— Focus on innovation and environmental sustainability
Sistem Pengurusan Maklumat Pesisiran Pantai Negara (e-PESISIR)	Jabatan Perhutanan Semenanjung Malaysia (JPSM) and Agensi Angkasa Malaysia (MYSA)	Started in 2012	Plan, implement, and monitor coastal conservation and rehabilitation	— Supports coastal ecosystem governance through spatial data systems

Appendix Table 5-3: International Database (non-exhaustive)

Database	Lead Agency/ Developer	Year Established	Purpose/Aims	Key Features
Join Genome Institute – Genome Portal	US Department of Energy (Office of Science)	Created in 1997	Global resource for genome and metagenome sequencing project data and metadata	— Genome Online Database (GOLD) — Comprehensive global metadata repository
GenBank	National Center for Biotechnology Information (NCBI)	Establish in 1988	Public DNA sequence database with annotated genetic data	— Receives direct submissions from individual researchers and institutions — Part of the International Nucleotide Sequence Database Collaboration (INSDC)
International Nucleotide Sequence Database Collaboration (INSDC)	NCBI, the European Molecular Biology Laboratory (EMBL) and the DNA Databank of Japan (DDBJ)		Global archive of nucleotide sequence data, from raw reads to annotations	— Open data exchange among three founding institutions — Covers all organisms and environments — Freely accessible without restrictive licensing
Canadian Centre for DNA Barcoding	The University of Guelph and Centre for Biodiversity Genomics in Canada	Founded in 2006	Species identification through DNA barcoding	— Authoritative DNA barcode reference library — Applies genetic technologies for conservation, biodiversity, and biosecurity
Ocean Gene Atlas v2.0 (OGA2)		2022	Marine genomic search and mapping tool	— User-friendly interface for locating homologous marine sequences — Includes Ocean Microbial Reference Gene Catalogue (OM-RGCv2) with Arctic Ocean data
The Environmental Genome Initiative	US National Institute of Environmental Health Sciences	Founded in 2017	Environmental impact assessment via genome science	— Tracks environmental and supply chain impacts — Supports global warming mitigation through better design and energy tracking
Marine Genome Project	Daniel Ortega and David (Dave) Mulé	Founded in 2019	Preserve marine genetic diversity for ocean health and resilience	— Conservation-focused initiative — Emphasis on biodiversity protectio
MG-Rast (metagenomic analysis server)	The University of Chicago and Argonne National Laboratory	Founded in 2016	Automated metagenomic data analysis and microbial population insights	— Open-access data submission portal — Over 512,000 datasets hosted and continuously updated
Patho systems Resource Integration Center	The University of Chicago	Founded in 2014	Support bacterial pathogen research through data integration and tools	— Specialised in infectious disease genomics — Rich analysis and visualisation tools

Appendix 5: Focus Topics for the Transformational Sustainability Leadership Module

Motivate: Open the Heart and Mind

The concept of leadership beginning with the individual is a widely accepted notion. This chapter creates time and space for participants to reflect on their current life, identity, culture, religious tradition and their relationships with the community and environment, both locally and globally. In doing so, four common life phases are introduced for self-examination: the reflexive mode (life on the surface), reflective modes (affective reflection, self-awareness and self-transcendence). All four phases are relatable, and no single mode is inherently better or worse than another.

To understand what makes a sustainability leader, it is essential to appreciate their traits, styles, skills, knowledge and attitudes. The unique combination of these elements in each individual contributes to their distinctiveness as a leader. Each leader needs to draw upon what is suitable for their own situation (considering personality and circumstances) to effect change and meet challenges.

Evaluate: Reality Check

Understanding the crucial relationship between human health and the health of the planet is essential for safeguarding human well-being and restoring Earth's ecosystems. This chapter delves into the concept of planetary health, providing participants with a comprehensive understanding of how both natural and human-made factors impact the environment and human health.
Participants will explore the interconnectedness of ecosystems, climate change, pollution and biodiversity loss, unravelling and realising the complex ways in which they affect human health and well-being. The chapter empowers participants with a reality check and equips them with the knowledge to make informed and responsible choices, contributing to a sustainable future where human health and planetary health are mutually supportive.

Convincing: There is Hope, Let Us Collaborate

While the reality is devastating, the power of partnership and collaboration underscores that there is hope for a better future when we work together. Through case studies, participants gain insights into real-world examples where a collaborative framework involving government, industry, academia and civil society, known as Quadruple Helix model, has been instrumental in assisting policymakers in designing and implementing inclusive policy interventions to address global challenges.
This chapter also explores the inherent challenges in implementing this model and proposes practical solutions to overcome them, emphasising the potential for collaborative efforts to drive meaningful change. By fostering a spirit of cooperation and innovation, this chapter inspires participants to engage in collective action, leveraging diverse perspectives and expertise to create sustainable solutions for the world's most pressing issues.

Strategies: Let Us Find the Solution – Using Knowledge

Understanding STEM's critical role in tackling planetary health challenges is essential for equipping participants with strategic tools to support informed, impactful decisions. This chapter encourages participants to harness the power of knowledge to find solutions, focusing on practical strategies for integrating STEM into planetary health leadership.
Through dynamic group discussions, participants will explore various topics, identify pressing problems and collaboratively brainstorm solutions that incorporate STEM. This highly interactive learning experience emphasises engagement, reflection and application, encouraging participants to actively engage with the material, reflect on its relevance and meaning, and to develop innovative solutions.

Solution: Understanding the Planet

To cultivate a systems thinking approach among learners as they tackle key, multi-sectoral issues exacerbated by climate change, rapid urbanisation and population growth, the Water-Energy-Food (WEF) Nexus has emerged as a valuable concept to describe and address the complex and interrelated challenges. This approach will be facilitated using engaging methods such as brainstorming sessions, group discussions and role-playing exercises.

Throughout this chapter, participants actively share innovative ideas, discuss challenges and collaboratively propose solutions. Interactive activities include exploring sectoral interlinkages, reflecting on Nexus solutions, selecting Nexus indicators, conducting Nexus policy analysis, pitching WEF Nexus projects and participating in a role-playing scenario on multi-purpose dams. These experiences

immerse learners in a dynamic learning environment, helping them understand the intricate relationships within the WEF Nexus. The chapter concludes with a reflective session where participants identify actionable steps to integrate sustainability principles into their professional practices. This comprehensive approach aims to equip learners with practical insights and skills to address the complex interdependencies of food, water and energy systems in the pursuit of sustainable solutions.

Action: Knowledge to Enable Action

This leadership programme is designed to provide participants with hands-on experience and real-world skills essential for leading initiatives that promote planetary health. This chapter provides an overview of the key components, objectives and expected outcomes of the module. It serves as a cornerstone in developing transformational sustainability leaders who are not only well-versed in theory but also capable of driving positive change through practical, impactful actions locally and globally in pursuit of planetary health.

Reflect: Self-Assessment and Declaration/ Pledge

Religion and faith play a significant role in the socio-cultural structure of Malaysian society, providing a valuable resource for enhancing environmental education and responsibility through their values and teachings. This chapter examines how religious institutions and traditional belief systems can promote ethical values that transform public behaviour and mindsets. The role of religion and faith-based organisations (FBOs) has long been recognised, as religious principles are widely accepted as critical providers of ethics and values for sustainability and transformational sustainability leadership.

Glossary

1. **8I Framework:** A framework with eight systemic enablers (Infrastructure, Infostructure, Intellectual Capital, Integrity Systems, Incentives, Institutions, Interaction, Internationalisation) for planetary health.
2. **8R Values:** Nature-centric philosophy (Respect, Rethink, Reduce, Reuse, Recycle, Restore, Repurpose, Revitalise).
3. **Agrifood Systems:** The integrated systems of agriculture and food production, distribution and consumption, including farming practices, supply chains and food policies.
4. **Anthropocene:** A proposed geological epoch dating from the commencement of significant human impact on Earth's geology and ecosystems.
5. **Basel Convention:** Financial incentives for states or regions to conserve ecosystems.
6. **Behavioural Insights:** Evidence-based approaches to encourage pro-environmental behaviours through nudges, incentives and campaigns.
7. **Biodiversity:** The variety of life forms within an ecosystem, including species diversity, genetic diversity and ecosystem diversity.
8. **Blue Economy:** Sustainable use of ocean resources for economic growth while preserving marine ecosystems.
9. **Carbon Pricing:** A policy tool assigning a cost to carbon emissions to incentivize reductions (e.g., carbon taxes or cap-and-trade systems).
10. **Carbon Sequestration:** The process of capturing and storing atmospheric carbon dioxide to mitigate climate change.
11. **CEPAA Strategy:** A national framework for Communication, Education, Public Awareness and Action to promote planetary health.
12. **Circular Economy:** An economic model emphasizing resource efficiency, waste reduction and recycling to minimize environmental impact.
13. **Circular Economy:** An economic system aimed at eliminating waste by reusing and recycling materials.
14. **Civil Service:** Government employees responsible for implementing public policies and programs.
15. **Common but Differentiated Responsibilities (CBDR):** A principle that acknowledges the different capabilities and responsibilities of countries in addressing environmental problems.
16. **Corporate Social Responsibility (CSR):** Business practices that align with ethical, social and environmental goals, contributing to sustainable development.
17. **Deforestation:** The large-scale removal of forests, often for agriculture or urban development.
18. **Dynamic Capabilities:** The ability of individuals, organizations and systems to learn, adapt and develop nature-based solutions (Innovative Capability, Adaptive Capability, Absorptive Capability).
19. **Ecological Corridors:** Chemicals that interfere with hormonal systems in humans and wildlife.
20. **Ecological Fiscal Transfers:** Financial incentives for states or regions to conserve ecosystems.
21. **Ecosystem:** A community of living organisms interacting with their physical environment.
22. **Endocrine-Disrupting Chemicals (ECDs):** Chemicals that interfere with hormonal systems in humans and wildlife.
23. **ESG (Environmental, Social and Governance):** Criteria used to evaluate a company's ethical impact and sustainability practices.
24. **Faith-Based Organizations (FBOs):** Religious institutions engaged in social, educational and environmental initiatives.
25. **Feed-in Tariffs (FiTs):** Incentive programs guaranteeing fixed payments for renewable energy fed into the national grid.
26. **Five Systemic Shifts:** The five foundational shifts for Malaysia's transformation (Strengthening Governance, Nurturing People, Planet-Friendly Businesses, Effective Communication and Behavioural Change, Sustainable Financing).
27. **Environmental Genomic Database:** A database of genetic information of Malaysia's flora, fauna and microbes for researchand conservation.
28. **Governance:** The systems and processes by which decisions are made and implemented, particularly in environmental and health policies.
29. **Government-Linked Companies (GLCs):** Corporations with significant government ownership or influence, often playing a key role in national development initiatives.
30. **Green Bonds:** Financial instruments funding environmentally friendly projects, such as renewable energy or conservation initiatives.
31. **Green Procurement:** Purchasing products and services with minimal environmental impact.

32. **Grid Modernization:** Upgrading energy infrastructure to support renewable integration, smart grids and energy storage.
33. **Gross Expenditure on R&D (GERD):** The total national investment in research and development as a percentage of GDP.
34. **Impact Tracking Framework:** A system to measure, learn and improve planetary health efforts.
35. **Khazanah:** Malaysia's natural heritage or assets.
36. **Majlis Kemampanan Negara:** National Sustainability Council (proposed).
37. **Malaysian Qualifications Framework (MQF):** A national system standardizing education and training qualifications across academic and vocational sectors.
38. **Mangroves:** Coastal trees or shrubs that grow in saline water, providing habitat and protecting shorelines.
39. **Marine Protected Areas (MPAs):** Chemicals that interfere with hormonal systems in humans and wildlife.
40. **Microplastics:** Tiny plastic particles that pollute water bodies and harm marine life.
41. **Multinational Corporations (MNCs):** Large companies operating globally, often influencing sustainability standards.
42. **NDPE (No Deforestation, No Peat, No Exploitation):** A commitment by industries (e.g., palm oil) to avoid deforestation, protect peatlands and ensure fair labour practices.
43. **Net Energy Metering (NEM):** A policy allowing consumers to generate renewable energy (e.g., solar) and sell excess power back to the grid.
44. **Ocean Thermal Energy Conversion (OTEC):** A technology harnessing temperature differences in ocean water to generate electricity.
45. **Peatlands:** Wetland ecosystems with dense organic soil, critical for carbon storage and biodiversity.
46. **Planetary Boundaries:** Nine Earth system processes that have boundaries within which humanity can continue to develop and thrive.
47. **Planetary Health:** The health of human civilization and the state of the natural systems on which it depends.
48. **Planetary Health Boundaries:** Limits within which human activity must operate to avoid destabilizing natural systems (e.g., climate change, biodiversity loss).
49. **Planetary Health Literacy:** The ability to understand and act on the links between human health and environmental sustainability.
50. **Post-Normal Times:** A period marked by complexity, chaos and contradiction in economic, social, political, cultural, technological and environmental systems.
51. **Renewable Energy (RE):** Energy derived from natural sources (e.g., solar, wind, hydro) that are replenished over time, reducing reliance on fossil fuels.
52. **Return on Values (ROV):** A measure of success that goes beyond financial returns to include environmental, social and governance values.
53. **Small and Medium-Sized Enterprises (SMEs):** Businesses with limited revenue, assets, or employees, often requiring targeted support to adopt sustainable practices.
54. **STIE (Science, Technology, Innovation and Economy):** A framework integrating scientific research, technological advancements, innovation and economic development to address planetary health challenges.
55. **Sustainability:** Practices that meet present needs without compromising the ability of future generations to meet theirs.
56. **Sustainable Financing:** Financial mechanisms (e.g., green bonds, grants) that support environmentally and socially responsible projects.
57. **Technical and Vocational Education and Training (TVET):** Skill-based education programs preparing individuals for careers in specific industries, including green technologies.
58. **Total Primary Energy Supply (TPES):** The total energy demand of a country, including all sources (fossil fuels, renewables, etc.).
59. **Transformational Sustainability Leadership Module (TSLM):** A module to build knowledge and skills for planetary health leadership.
60. **Vector-borne Diseases:** Diseases transmitted by vectors, such as mosquitoes.
61. **Whole-of-Nation Approach:** An approach that involves all sectors of society (government, private sector, civil society, etc.) in addressing national challenges.
62. **Xenobiotics:** Chemical substances that are foreign to an organism or biological system, often pollutants.
63. **Zone of Ecosystem Balance (ZEB):** A state where planetary boundaries are balanced with socioeconomic development.
64. **Zoonosis:** Diseases that can be transmitted from animals to humans.

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NPHAP Team Members

Framework and Integration
Prof Dr Mahendhiran Sanggaran Nair FASc (Chairperson)
Dr Kishore Ravuri (Chief Writer)
Prof Pervaiz K Ahmed
Prof Santha Vaithilingam
Prof Ts Dr Ting Choo Yee

Governance
Prof Dato' Ir Dr A. Bakar Jaafar FASc (Chairperson)
Dr Ibrahim Abu Ahmad (Writer)
Mr Satpal Singh Dillon
Datin Seri Sunita Mei Lin Rajakumar
Prof Dato' Dr Aishah Bidin FASc
Mr Kiu Jia Yaw FASc
Prof Emeritus Dato' ChM Dr Mazlin Mokhtar FASc
Datuk Fadilah Baharin FASc
Dato' Dr Nadzri Yahaya
Prof Emerita Datuk Dr Rashidah Shuib
Dr David McCoy
Dr Chan Chee Khoon
Assoc Prof Dr Ooi Shih Yin

Environment & Health
Academician Distinguished Prof Datuk Dr Looi Lai Meng FASc (Chairperson)
Dr Ravigadevi Sambanthamurthi FASc (Writer)
Prof Dr Yvonne Lim Ai Lian FASc
Dr Vivien How
Prof Victor Hoe Chee Wai Bin Abdullah
Dr Rahimatsah Amat FASc
Dr Fiffy Hanisdah Saikim
Dato' Halimah Hassan
Ts Raja Shazrin Shah Raja Ehsan Shah FASc
Mr Mogesh Sababathy
Datuk Dr Abdul Rahim Nik FASc

Sustainable Food
Prof Dato' Dr Zulkifli Idrus FASc (Chairperson)
Ms Maizura Ismail (Writer)
Assoc Prof Dr Mohamad Faizal Bin Ibrahim (Writer)
Prof Dato' Dr Aileen Tan Shau Hwai FASc
Prof Dr Loh Teck Chwen FASc
Dr Suresh Chandran
Prof Datuk Dr Tengku Aizan Tengku Abdul Hamid FASc
Datuk Jeffrey Ng Choon Ngee
Dato' Dr Jalaluddin Harun FASc
Prof Datuk Dr Mad Nasir Shamsudin FASc
Prof Dato' Dr Ahmad Ibrahim FASc

Acknowledgement

NPHAP Team Members

Energy Transition
Prof Dato' Dr Kamaruzzaman Sopian FASc (Chairperson)
Prof Dr Norasikin Ahmad Ludin (Writer)
Ts Dr Chantara Thevy Ratnam FASc
Mr Aizal Baharuddin
Prof Ir Dr Haslenda Hashim FASc
Prof Ir Ts Dr Zainuddin Abd Manan FASc
Ir Dr Suzana Yusup FASc
Dr Chan Hoy Yen
Ir Dr Norshah Hafeez Shuaib
Ms Ilham Fadilah Sunhaji
Mr Abdul Shukor Hassan
Mr Dhana Raj Markandu

Research & Education
Prof ChM Dr Noorsaadah Abd Rahman FASc (Chairperson)
Dr Doria Abdullah (Writer)
Prof Emeritus Dr Nik Meriam Nik Sulaiman FASc
Prof Ir Dr Denny Ng Kok Sum
Prof Datuk Dr Mohd Hair Bejo FASc
Mr Jaffri Ibrahim
Prof Emerit us Datuk Dr Azizan Ba haruddin FASc
Ms Finaswani Mohamed Zin
Prof Ir Dr Shaliza Ibrahim FASc
Assoc Prof Dr Noor Zalina Mahmood
Prof Ts Dr Shahrina Md Nordin FASc
Prof Dr Poline Bala FASc

Values, Cultural Shift of Society, Behavioural Changes and Communication
Prof Tan Sri Dr Jemilah Mahmood (Chairperson)
Ts Raja Shazrin Shah Raja Ehsan Shah (Writer)
Mr Shawn Keng Teck Ee
Assoc Prof Dr Chan Siok Yee
Assoc Prof Sr Dr Choong Weng Wai
Mr Aidil Iman Aidid
Ms Ushar Daniele
Prof Adeline Johns-Putra
Mr Oliver Lacey- Hall
Ms Melissa Tan
Dr Nur Syafrina Mohd Sharif
Prof Mohd Said Bani C.M. Din

ASM Management

Hazami Habib, Chief Executive Officer
Nitia Samuel, Chief Strategy officer
Dharshene Rajayah, Chief of International Affairs and Communications

ASM Team of Analyst

Dr Hor Jia Wei
Teng Yu He
Ts Jagdish Kaur Chahil
Mohamad Hasril Abd Hamid
Norsyazlin Abd Rashid
Farah Amirah Mohd Nasri
Matthew Raj Alias
Muhamad Fahmi Isa
Nurdiana Ismail
Nor Azwa Musiran
Haikal Hikmal Hazam
Ratnamalar Rajasingam
Ng Yin Zhuang
Kausaalya Nagaraja
Ts Nurul Huda Abdul Rahman
Afifa Mahamad Saidi
Nur Alya Batrisya Ismail
Dr Wan Safiyyah Nurnajah Wan Ahmad Tajuddin
Farha Husna Ramli
Amira Aqilah Saidin
Nur Hidaayah Abu Hanifiah
Syamimi Md Jamal
Muhammad Afiq Rabani Main
Siti Nur Shahirah Wahab
Alfred Low Boon Sin

ASM Creative & Production Team

Naina Afifi Rosly
Mohd Najmie Mohd Yusoff
Muhammad Akmal Hakim Mohamad
Najib Mohd Idris
Syakirah Nurizzati
Siti Sarah Rahman

Research Assistant

Khairunnisa Binti Kadaruddin
Nur Syipa Nadhirah Abu Bakar
Fareed Farihin

Sunway University Analysts

Dr Teow Hui Hui
Yeng Hong Qing
Choong Chai Lim
Sudhan Mahalingam

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Level 20, West Wing, MATRADE Tower,
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50480 Kuala Lumpur

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