2015

Academy of Sciences Malaysia

SCIENCE OUTLOOK

action towards vision

The Philosophy of Science Outlook

Science Outlook – An independent review of the STI landscape in Malaysia and the way forward

WHERE WE ARE IN STI	GAPS	ACTION TOWARDS VISION
Stocktaking	Identify indicators	Way forward
Study key trends & challenges	Benchmarking	Towards evidence-based informed decision making
Data gathering	Evaluation	Future implications
International reviewers	Analysis	Recommendations

Conduct of the Study

Science Outlook – Inclusive input from members of Parliament, policy makers, scientific community, academia, industry leaders, international STI organisations, STI professional bodies and NGOs

8 Stakeholder Engagements
International and National levels

73 Organisations and 25 Experts / Leaders
Involved in Surveys, Industry Perception Audit, Focus Group Discussions, Interviews, Hansard Analysis, Media Engagement Exercises & Financial Modelling

28 Organisations
Provided key information & data

196 References

4 International Reviewers

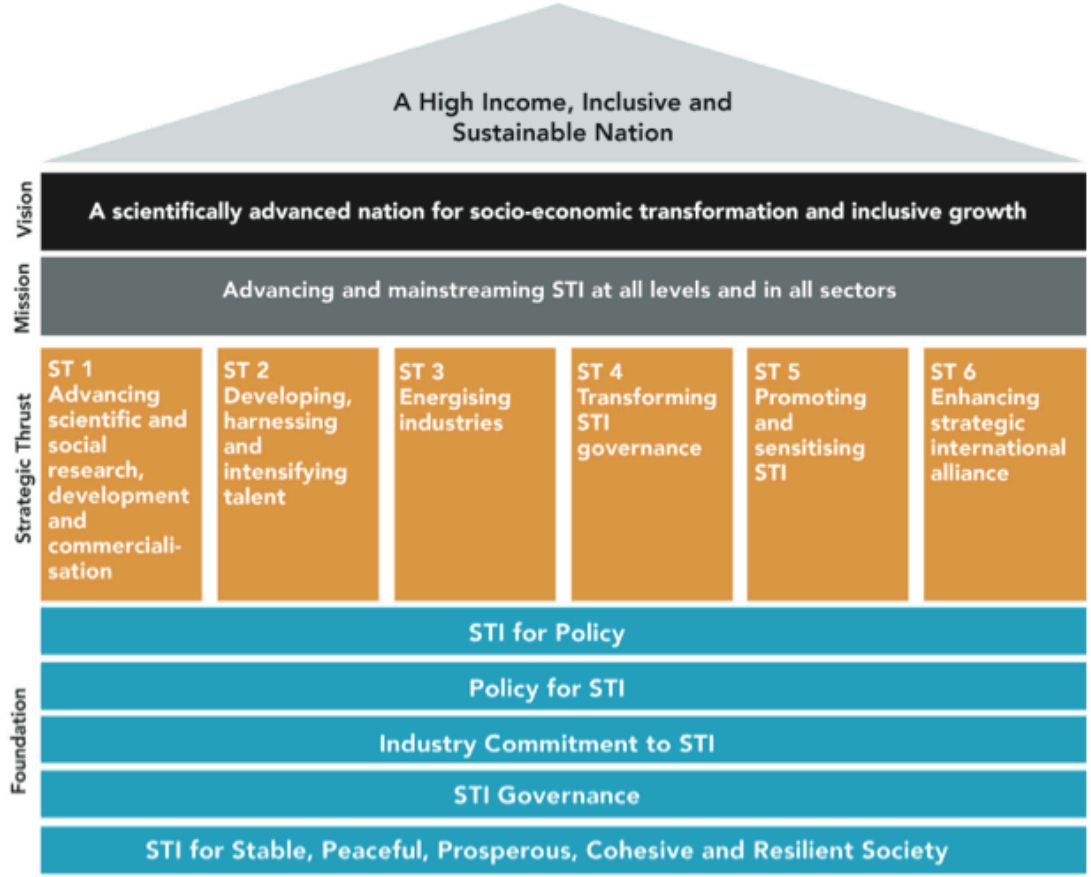
14 Steering Committee Members

6 Working Groups
-STI Governance (13 members)
-RDC (11 members)
-STI Talent (6 members)
-Energising Industries (6 members)
-STI Enculturation (10 members)
-Strategic International Alliance (5 members)

22 Analysts

Science Outlook

Aims to provide evidence-based insights and new perspectives on the Malaysian STI landscape



based on six strategic thrusts in the **National Policy on STI (2013 – 2020)**

Transition of the Malaysian Economy

STI drives the Innovation-Led Economy

1957 to 1980 (1MP-3MP)

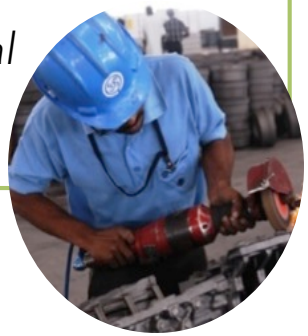
Agriculture Based Economy

Basic Input Factors
- *Land*
- *Labour*

1981 to 2000 (4MP-7MP)

Resource-Led Economy

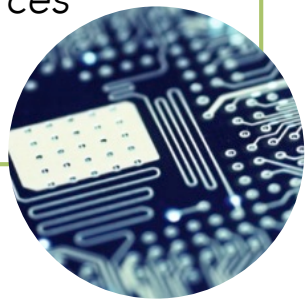
Basic Input Factors
- *Infrastructure*
- *Collateralised risk-free capital*
- *Labour*
- *Institutional Support*



2001 to 2020 (8MP-11MP)

Innovation-Led Economy

Critical Success Factors
- *STI Talent (Knowledge Worker)*
- *Value creation from R&D*
- *Market forces*



Rewards are rapid & sustainable:
- Wealth creation
- Employment creation
- Societal well being

6 Chapters in the Science Outlook

STI GOVERNANCE

R,D&C

STI TALENT

ENERGISING INDUSTRIES

STI ENCULTURATION

STRATEGIC INTERNATIONAL ALLIANCE

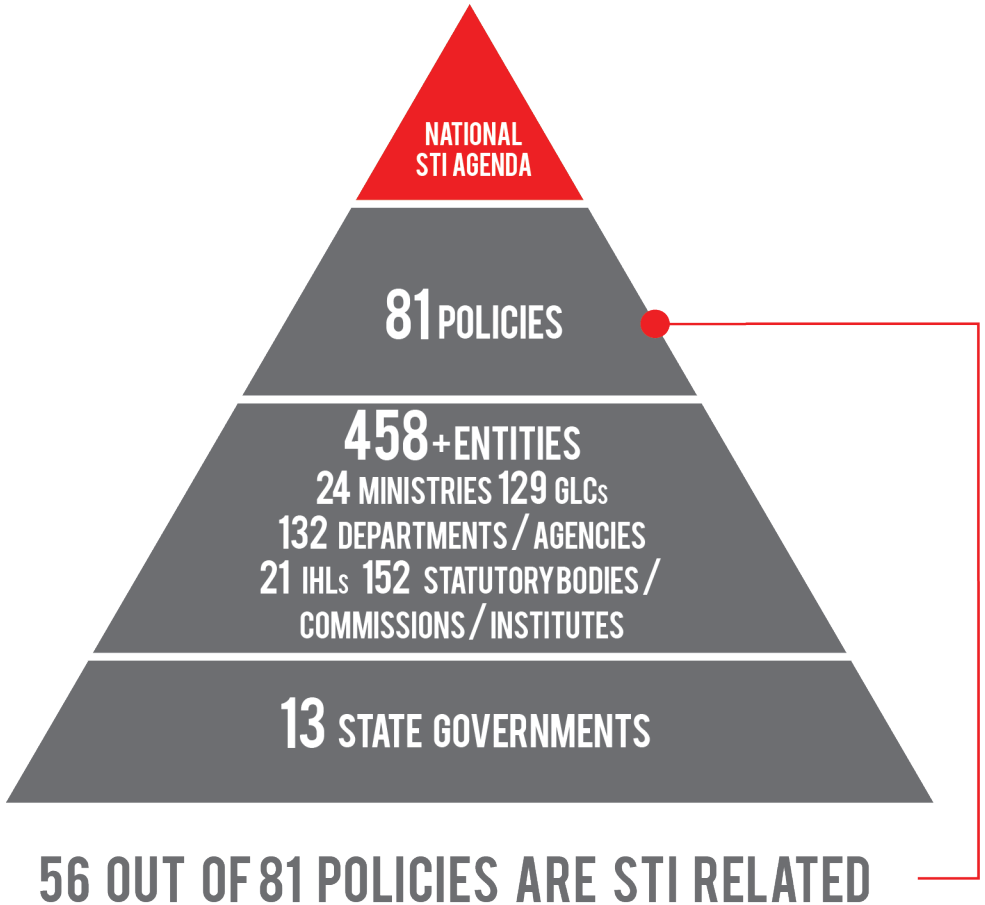
Key Focus Areas

that contribute to a robust STI ecosystem


01
STI Governance

1. STI Governance

AN OVERARCHING NATIONAL STI AGENDA FOR A UNIFIED EXECUTION STRATEGY



56 OUT OF 81 POLICIES ARE STI RELATED

Need for :

- Overarching STI Master Plan to implement National STI Agenda
- Well coordinated and integrated policy measures

1: STI Governance

- Planning needs to be hand in hand with evaluation & monitoring
- Evaluation & monitoring to be institutionalised with accountability

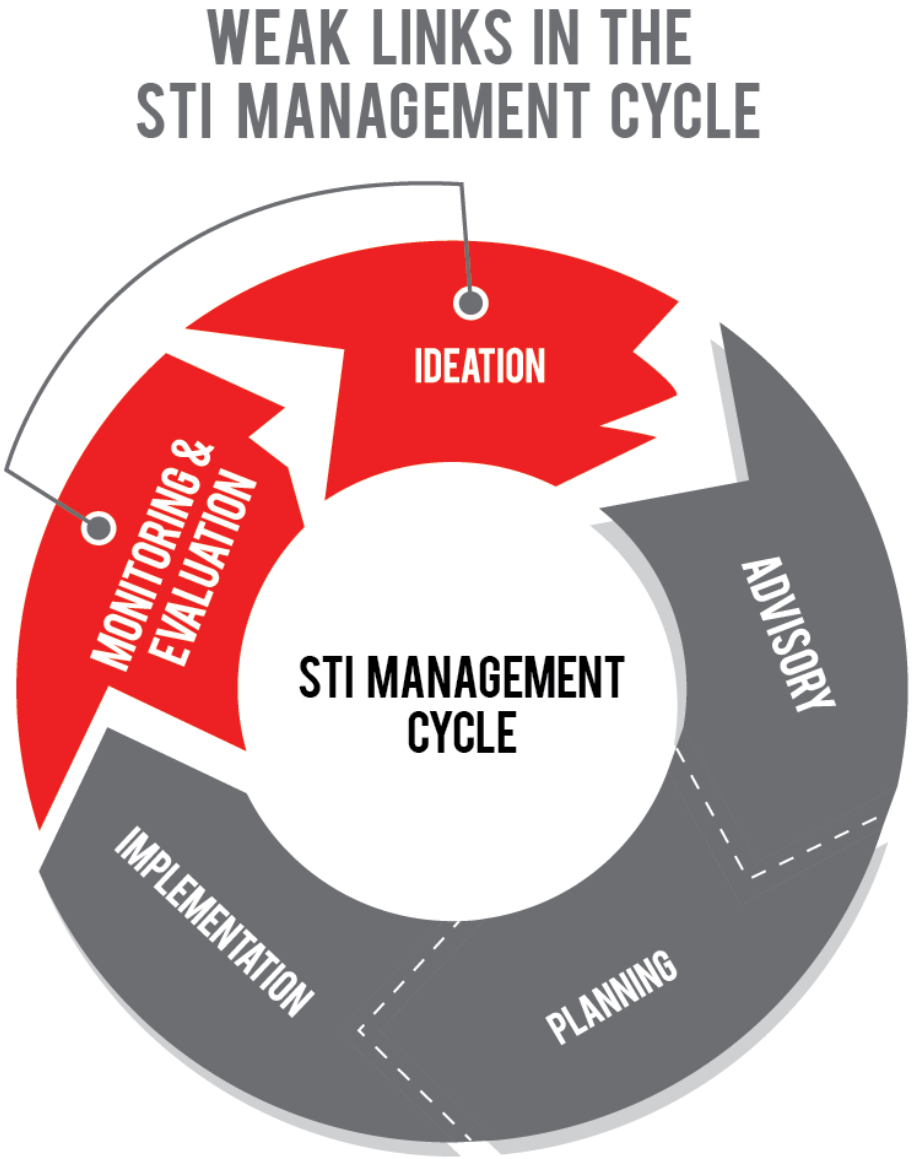
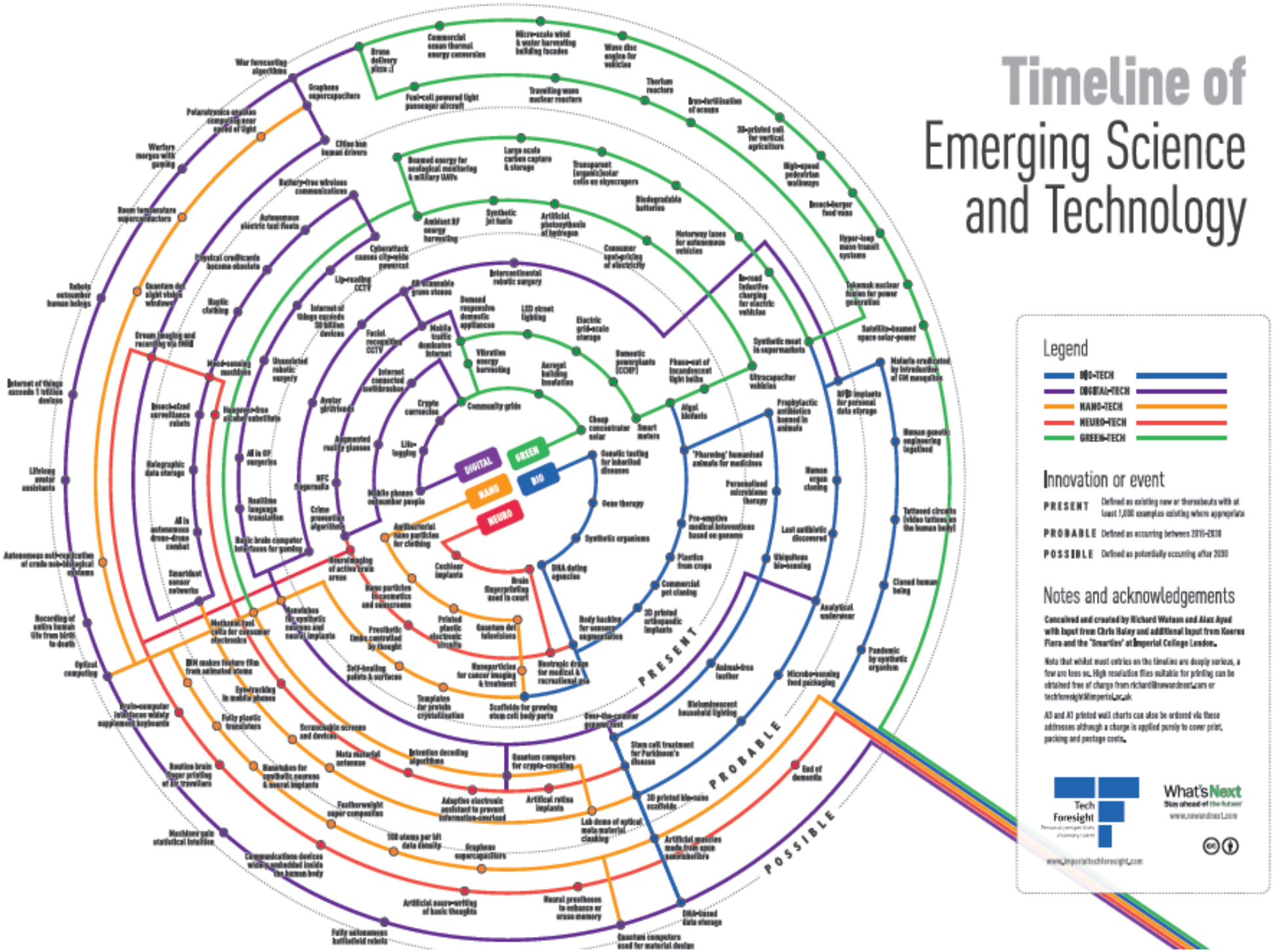


Figure 1-4. STI Management Cycle in South Korea
Sources: ERAWATCH; OECD 2012



Timeline of Emerging Science and Technology

TRENDS & TECHNOLOGY TIMELINE 2010+

A roadmap for the exploration of current & future trends
(+ some predictions to stir things up. More at nowandnext.com)

TIME ZONES

ZONE 1: 2010-2015

ZONE 2: 2015-2020

ZONE 3: 2020-2025

ZONE 4: 2025-2035

ZONE 5: 2035-2050

Notes on time travel

This map is a broad representation of some of the trends and technologies currently visible. Improvement works are carried out at weekends and travellers should check to see whether lines are still operable before commencing any journeys. Helpful suggestions concerning new routes and excursions are always welcome.

If you wish to travel outside of Zone 1 you are advised to bring comfy shoes and a camera. Travellers are also advised to bring their own supplies of food and water although weapons are unnecessary if you keep to well trodden paths. Also note that travel into Zone 5 is not available for people aged over 75 years of age.

A3 and A2 Prints of this map

Full colour prints of this map are available to anyone that asks nicely. A small charge is levied to cover print and postage costs only. Contact < richard@nowandnext.com > stating whether you'd like A3 or A2 size and saying which country the map is to be delivered to. Delivery is available to anywhere in the world. Alternatively, just print this out yourself (A3 minimum recommended)

Sourced

Material for this map has been soured from a number of publications including Future Files and What's Next

FUTURE FILES
A BRIEF HISTORY OF THE NEXT 50 YEARS
RICHARD WATSON

www.futuretrendsbook.com

What's Next
www.nowandnext.com

Acknowledgements

This map was conceived and created by Richard Watson at Nowandnext.com with some help from Benjamin Frazer at Snap. Also thanks to Oliver Freeman, Mike Jackson and Scott Martin.

LEGEND

1. Society & Culture
2. Geopolitics
3. Energy & raw materials
4. Science & technology
5. Healthcare & Medicine
6. Retail & leisure
7. The Economy
8. Financial services
9. Environment & Climate
10. Food & drink
11. Transport
12. Travel & tourism
13. Home & family
14. IT & telecomms
15. News & Media
16. Work & Business

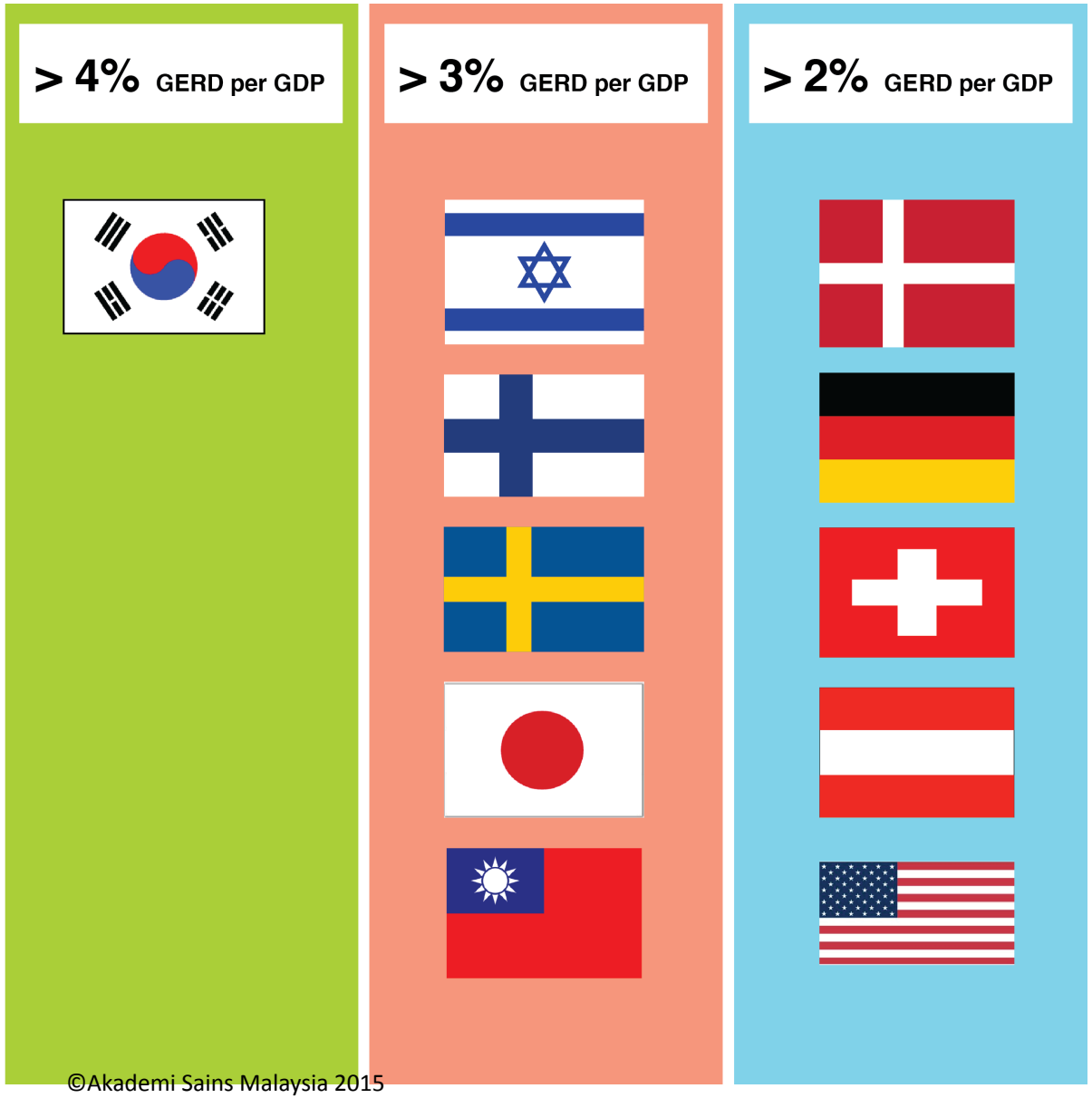
- Mega trend
- Trend
- Prediction
- Dangerous currents
- Poor visibility
- High-speed link
- Partial ruin

Global risks*

* Low probability/high impact events that could derail any of the above trends and predictions

- ▲ Commodity price spikes
- ▲ Raw materials shortages
- ▲ Mass migration of population
- ▲ Nuclear terrorism
- ▲ Internet brownouts
- ▲ Electricity shortages
- ▲ Rapid increase in cyber crime
- ▲ Critical infrastructure attack
- ▲ Rogue stakeholder
- ▲ WMD Proliferation
- ▲ Green energy bubble
- ▲ Genetic terrorism
- ▲ Collapse of US dollar
- ▲ Global supply chain disruption
- ▲ Terrorist attack on urban water supply
- ▲ US/China conflict
- ▲ Israel/Iran conflict
- ▲ Bisphenol A link to cancer
- ▲ Geographical expansion of Russia
- ▲ Major earthquake in mega city
- ▲ Global pandemic
- ▲ Conflict with North Korea
- ▲ Political disintegration of Saudi Arabia
- ▲ Systemic failure of financial system
- ▲ Fundamentalist takeover in Pakistan
- ▲ Middle class revolution
- ▲ Collapse of China
- ▲ Mobile phone link to cancer
- ▲ Credit Default Swaps
- ▲ Rogue asteroid
- ▲ Major nano-tech accident
- ▲ Space weather disruption to comms
- ▲ Aliens visit earth
- ▲ Return of the Messiah
- ▲ People taking trend maps too seriously

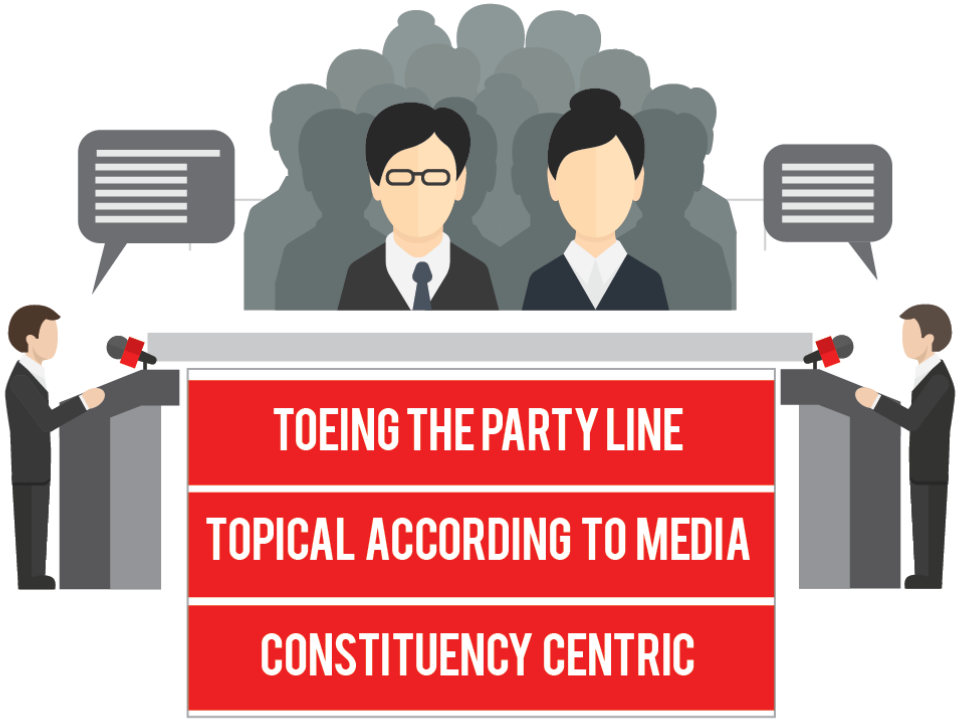
1: STI Governance



Nations with high economic output have **stable STI governance structure**

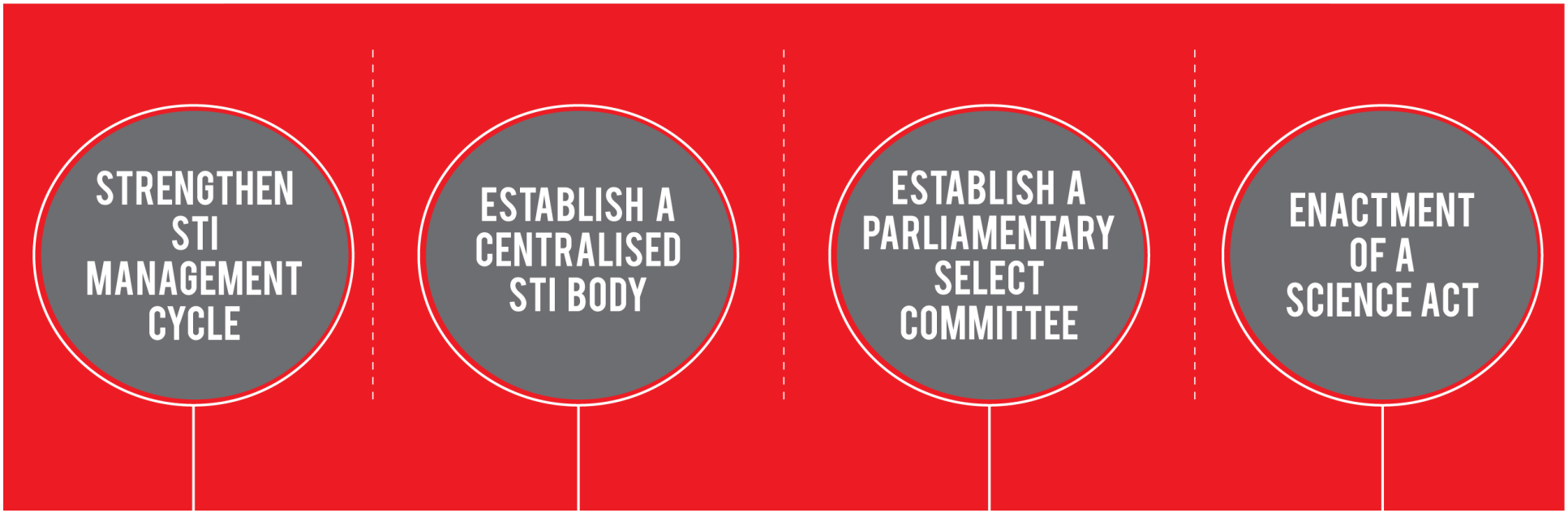
1: STI Governance

CURRENT PARLIAMENTARY DEBATES



Based on Hansard Analysis 2008-2013

An enabling environment for effective STI Governance



An Enabling Environment For Effective STI Governance

- Focus on continuous Monitoring & Evaluation as well as Ideation
- Empowerment of centralised STI coordination & monitoring body that transcends across ministries
- Parliamentary Select Committee on STI will build the necessary political will & create legislative consensus towards promoting STI agenda
- Proposed Science Act (of Malaysia) will serve as an overarching Master Plan for a unified execution strategy

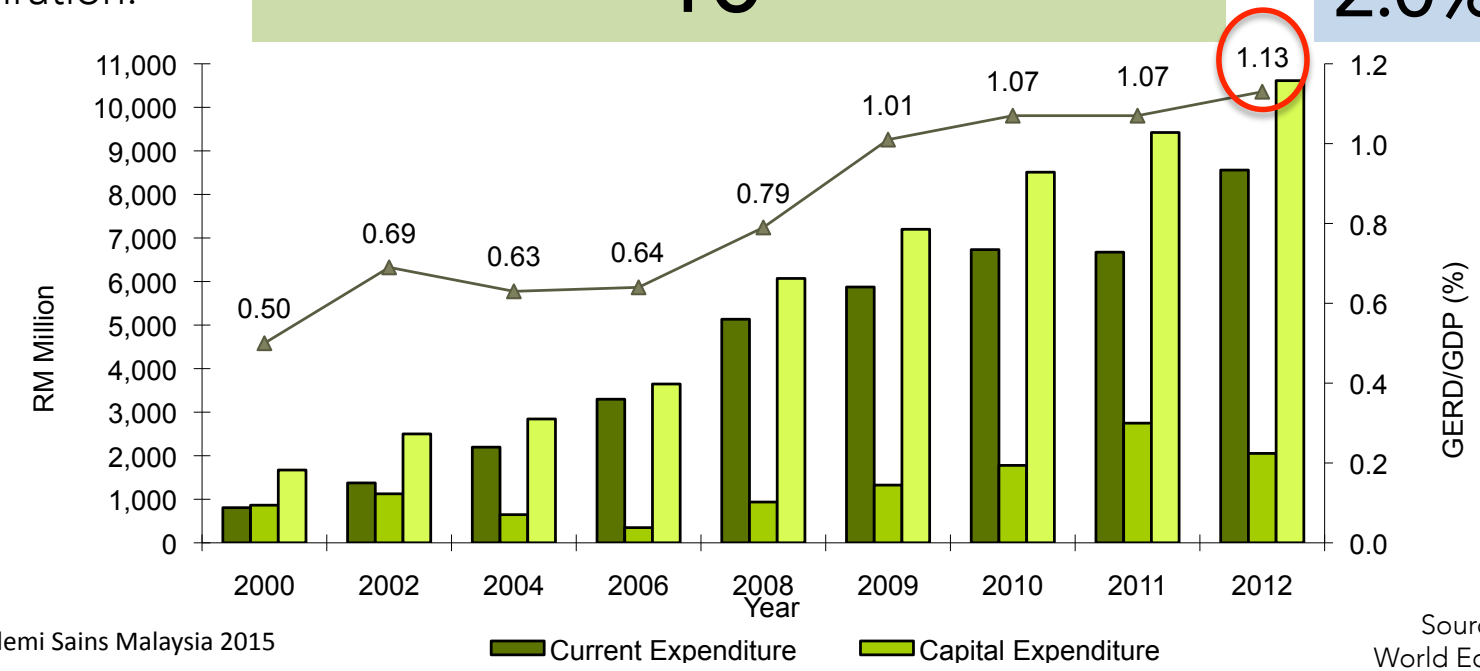

U2
Research, Development,
& Commercialisation (R,D&C)

2: R,D&C

Does R,D&C in Malaysia Address **National Priorities, Challenges & Potential Opportunities** towards Societal Well-being?

	Global Competitiveness Index (GCI) 2014-2015 (WEF)	Global Innovation Index (GII) 2014
Malaysia ranked:	20th	33rd
Malaysia's aspiration:	10th	

Target GERD per GDP: 2.0%



Sources: MASTIC 2014b; World Economic Forum 2014

2: R,D&C

What is the R,D&C landscape in Malaysia?

Multiple research priority areas, players and grants

6 NKREA

MOSTI Focus Areas

9 NSRC Priority Areas

12 NKEA

12 manufacturing sectors

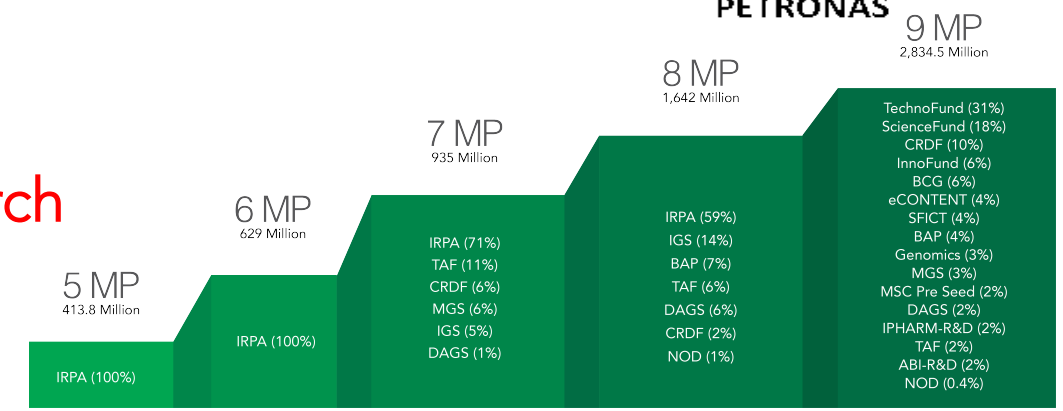
8 non government business areas

11 Development Areas

Niche Priority Areas

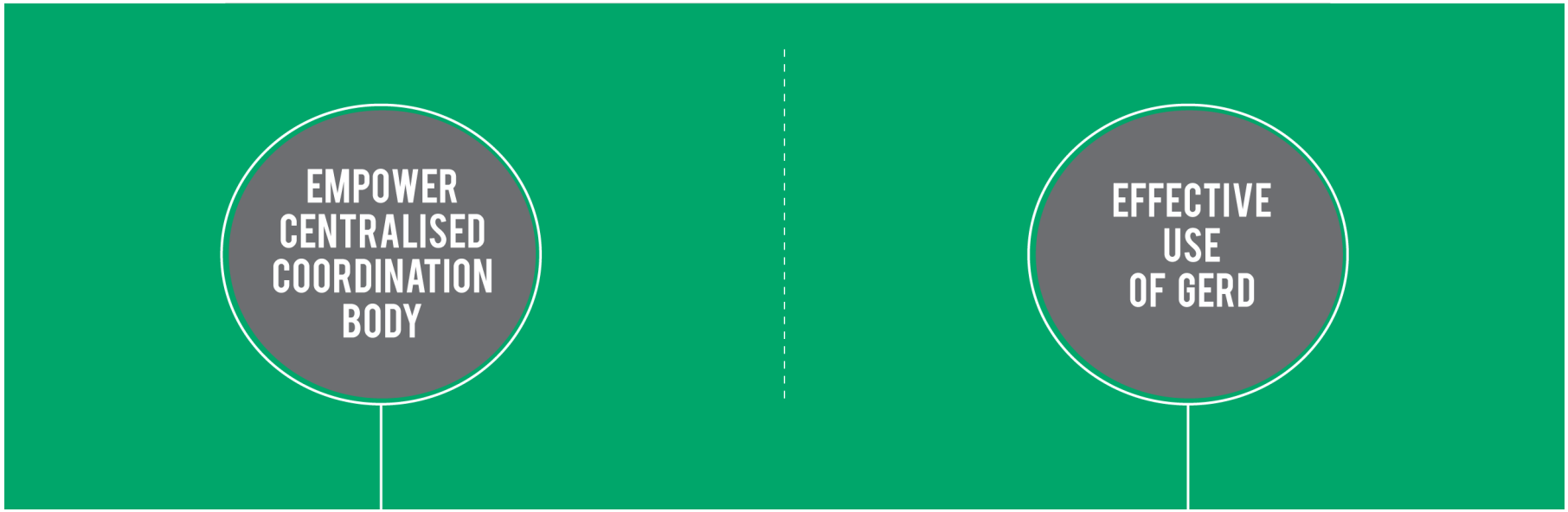
MOSTI	MOH	MOHE	MOA	NRE	MOD	MOT	KKR	KPPK	KETTHA
SIRIM	IMR	USM	MARDI	FRIM	STRIDE	MIROS	CREAM	LGM	PTM
MIGHT	CRC	UPM	VRI	NAHRIM				MPOB	TNB
MIMOS		UM	FRI					MCB	PETRONAS
BIOTECH		UKM							
MDeC		UTM							
Others									

Fragmented research activities



Source: MOF

Measures to build capacity and establish the socio-economic impact of Malaysian R,D&C



Measures To Build Capacity and Establish The Socio-Economic Impact of Malaysian R,D&C

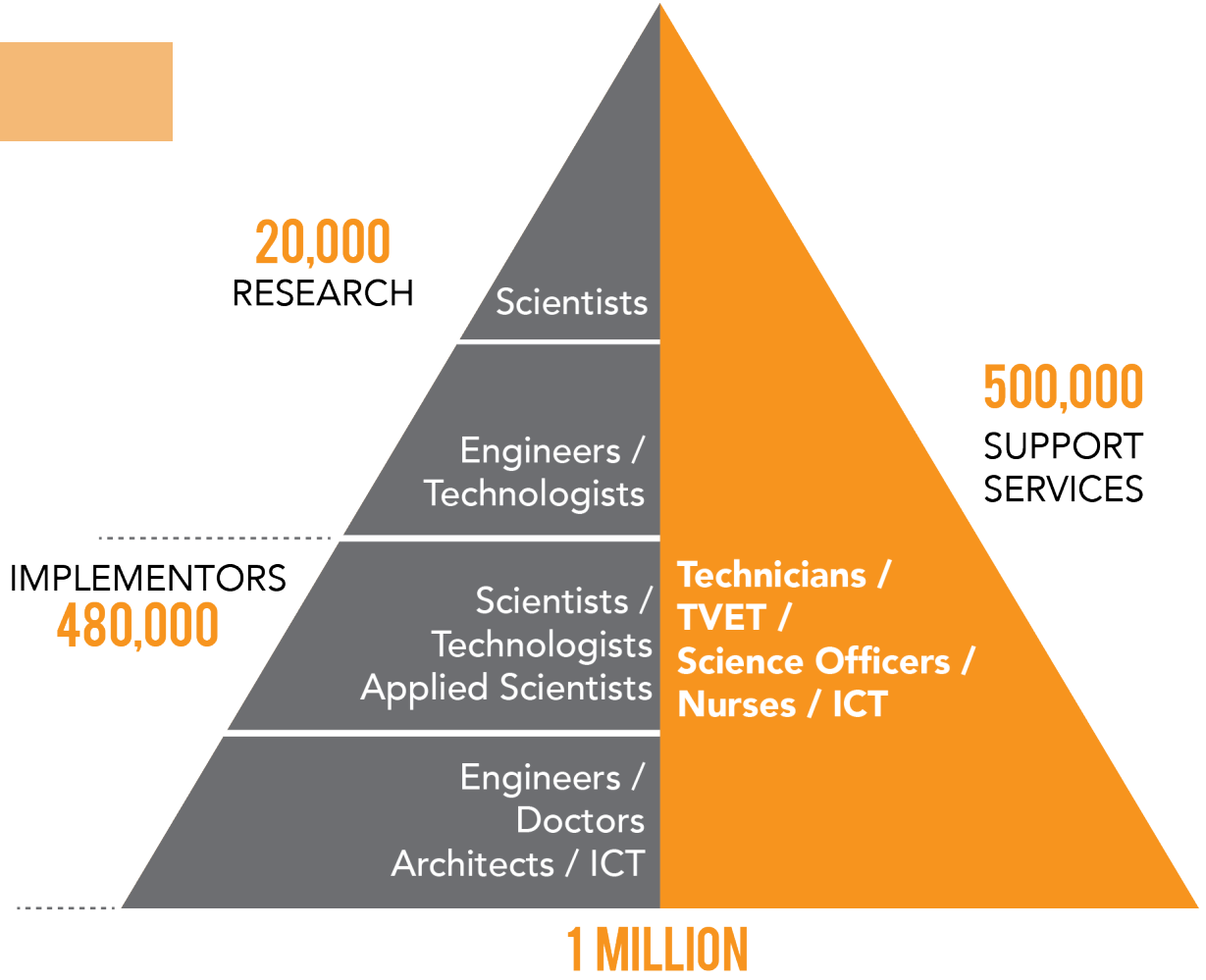
Seamless and Integrated Implementation, Management & Monitoring

- Empower centralised coordination body
- To allow research to transition smoothly to subsequent stages and collaboration with industry
- To evaluate beyond the ROI
- To strategise and focus on effective utilisation of R&D expenditure – ideation fund


STI Talent

3: STI Talent

How is Malaysia positioned with regards to its STI Talent pool?



Cohort	2012 (Current)		2020 (Projection)		Advanced Countries
Highly skilled STEM WF	0.7% (of 13 mil WF)	85K	3% (of 15 mil WF)	500K	30% (Average)

3: STI Talent

Development Stage

Does Malaysia have a pipeline of STEM talent and will it be sufficient and competitive enough to meet the country's future human capital needs?

Since 1967

	SCIENCE : NON-SCIENCE
TARGET	60 : 40
1986	31 : 69
1993	20 : 80
2001	29 : 71
2004	36 : 64
2011	44 : 56
2014	21 : 79

ENROLMENT

ELIGIBILITY

A decline in interest in Science, contributing to STI talent depletion

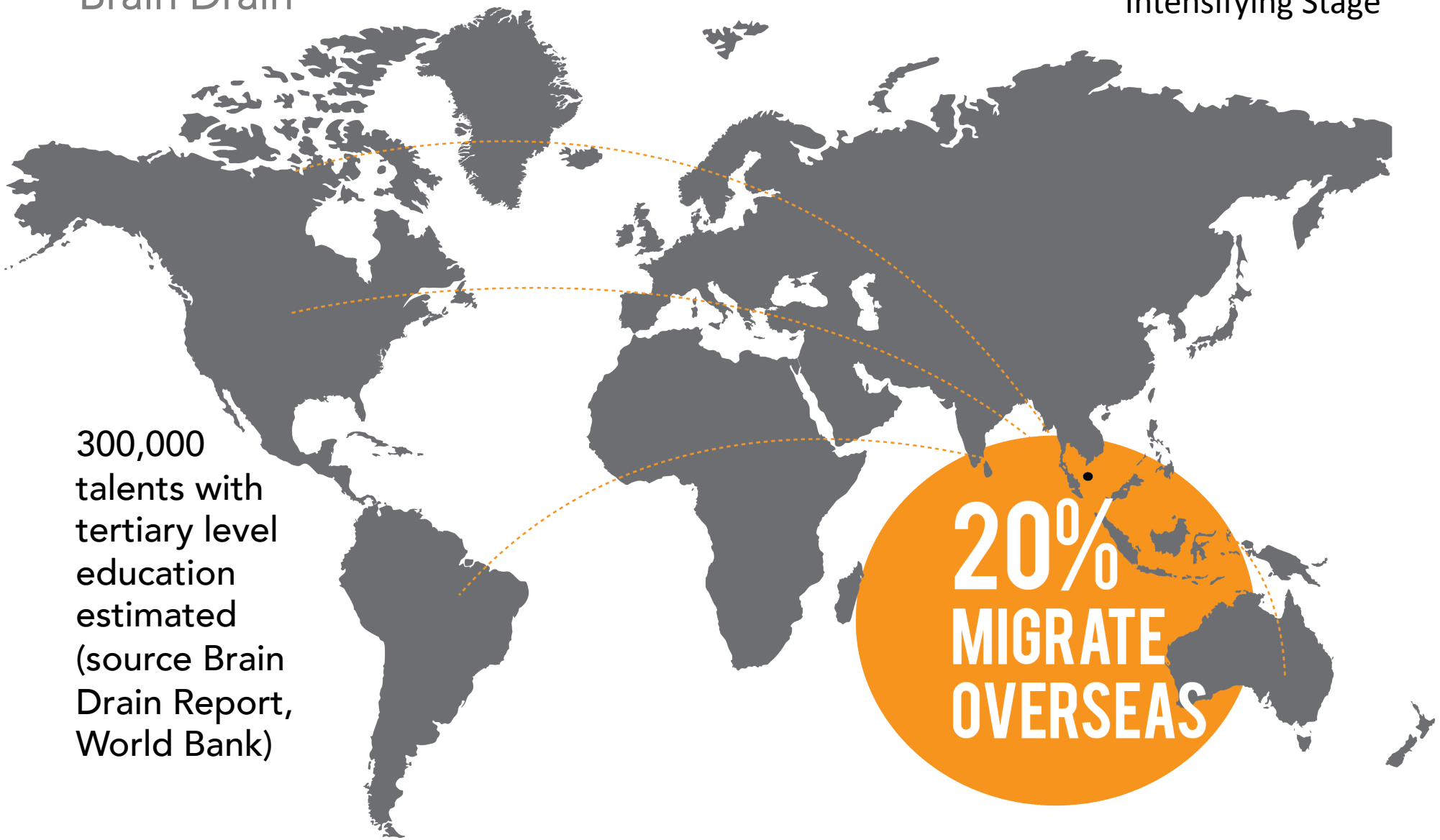
LOWBAR QUALITY TEACHING

41% DO NOT HOLD A DEGREE
37.1% SPM/STPM LEAVERS
3.8% DIPLOMA HOLDERS

70% DO NOT QUALIFY FOR DEGREE PROGRAMME

- Ineffective teaching methodology
- Ad-hoc changes in policies
- Low levels of awareness of the demand for specialised talent

Brain Drain



300,000 talents with tertiary level education estimated (source Brain Drain Report, World Bank)

Developing, harnessing and intensifying talent

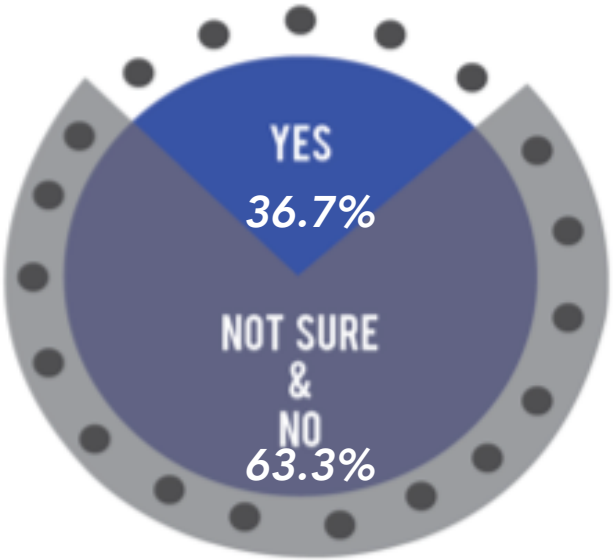
- A strategic framework is needed to guide human capital development in S&T services and delivery
- Drastic intervention measures need to be taken at each domain of the human capital value chain
- A 'sustainable' action plan for retaining STI Talent (especially to fuel the high-priority sectors of the economy)


04
Energising Industries

4: Energising Industries

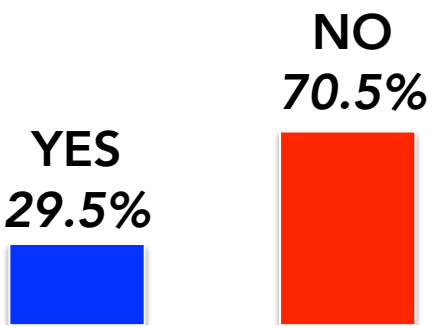
How engaged are our industries with the National STI agenda?

Industry Awareness of STI related Policies/Initiatives/ Incentives



Source: ASM Industry Perception Audit, 2014

Collaboration



Industry existing partnership with any R&D institute or university for product innovations

(Source: ASM Industry Perception Audit, 2014)

Reference Point

TOP THREE EXTERNAL INNOVATION INFORMATION SOURCES, 2008

1. 37.6% CLIENTS
2. 36.8% SUPPLIERS
3. 31.9% COMPETITORS

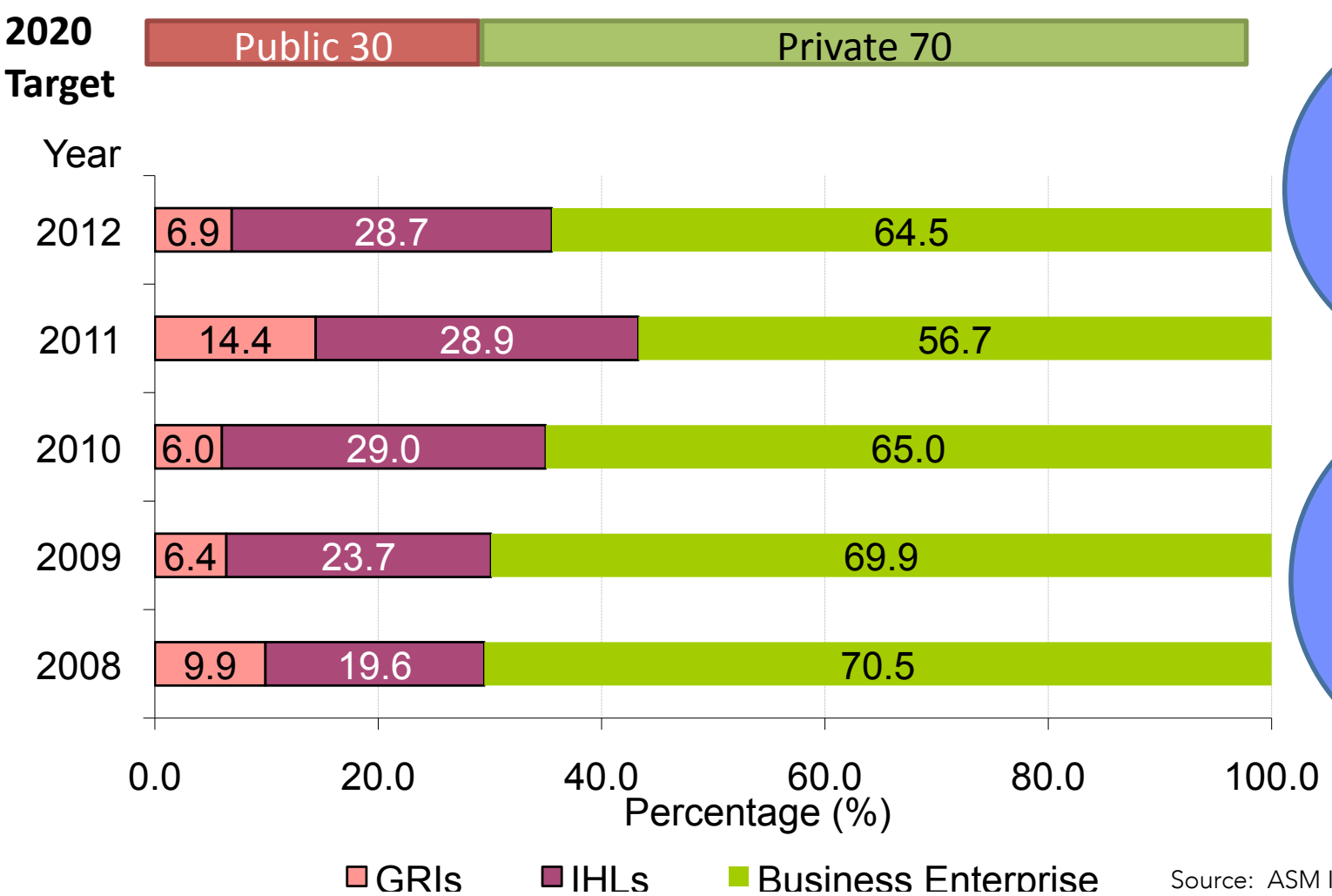
.
.
.

8. 16.8% UNIVERSITIES...
WITH A POTENTIAL OF INCREASE

Source: MASTIC, 2011

4: Energising Industries

Are our industries willing to undertake R&D?



58.7% have devoted R&D

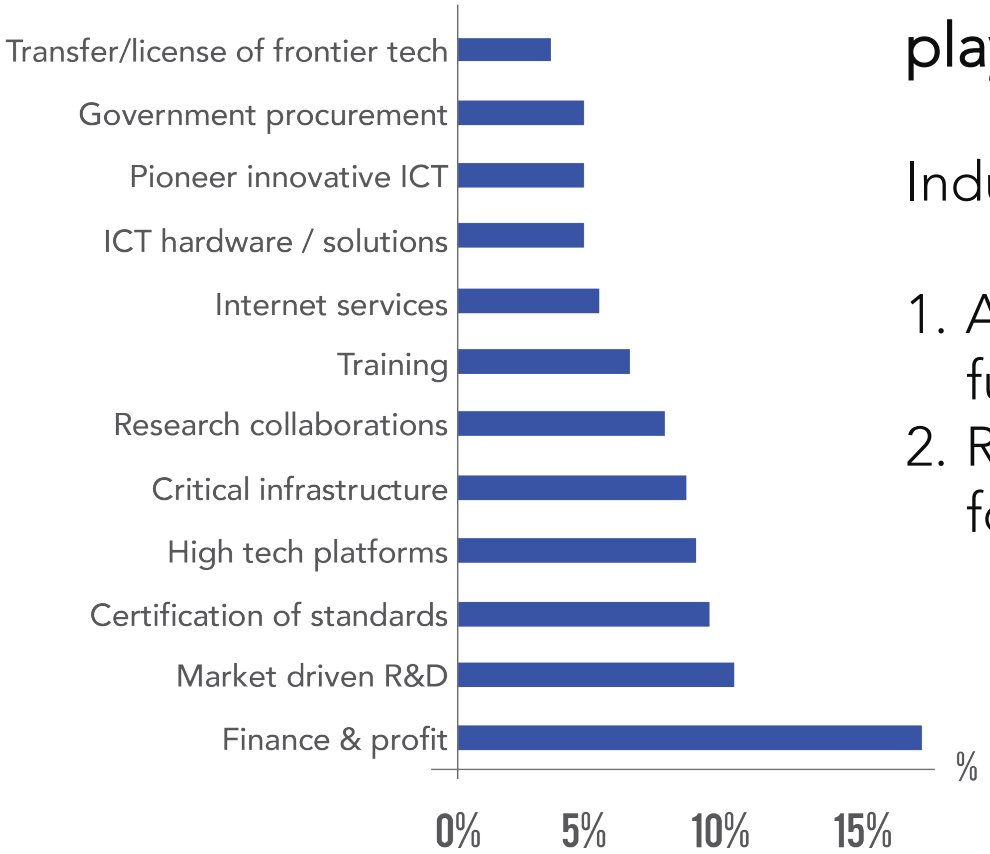
16.0% will increase R&D spending within 5 years

Source: ASM Industry Perception Audit, 2014

Source: MASTIC, 2015

4: Energising Industries

TOP PRIORITIES THAT AIDED BUSINESS GROWTH/DEVELOPMENT

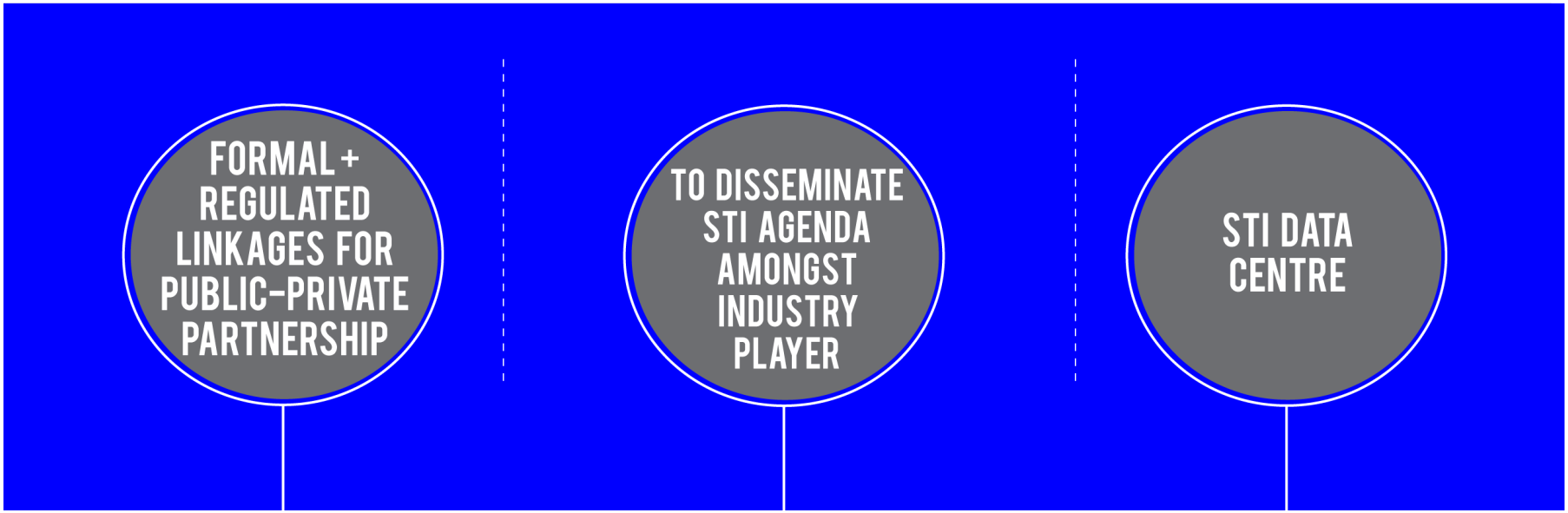


What motivates the industry players to invest in R&D?

Industry is receptive to:

1. Availability and access to public funds for R&D
2. Research that provides solutions for business & promises ROI

An ecosystem that will motivate the industry to undertake more R&D and to contribute significantly to the STI Agenda of Malaysia



Motivate industry to undertake more R&D for inclusive value creation

- An "STI Stakeholder Engagement Model" for STI policy implementation and collaborations that is both supply-oriented and demand-driven
- Foster quadruple helix partnership
- Aggressive and continuous information channels to disseminate focal areas of National agenda to STI industries


05
STI Enculturation

5: STI Enculturation

Is STI Exciting and Meaningful to Malaysians?

OVERALL, MALAYSIANS HAVE

HIGH INTEREST,

IN STI BUT

KNOWLEDGE IS LOW

5: STI Enculturation

Malaysians interest in STI issues is temporal, driven by current issues

Interest in **Space Exploration**

Lynas CORPORATION LTD

use of **Nuclear Technology** to generate power

use of **Computer Technology**

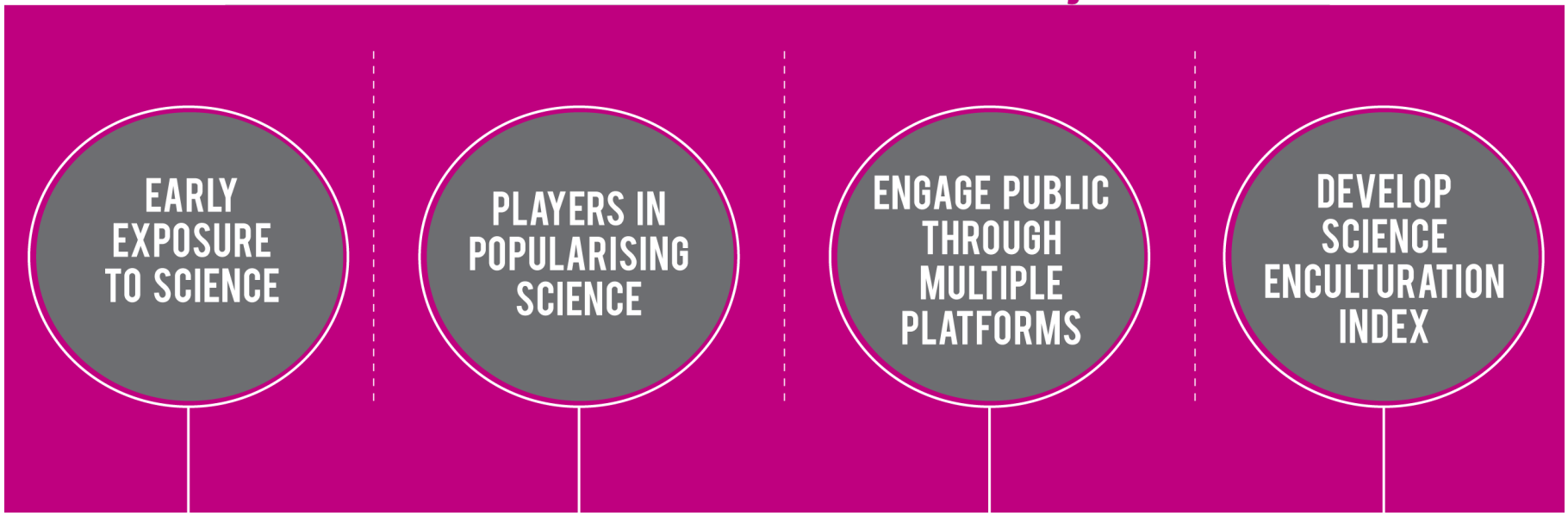
Environmental Pollution issues

5: STI Enculturation

STI Enculturation Process

Interest → Literacy → Mindset Change

STI Enculturation Plan to enable and sustain the process of STI enculturation in the country



Enabling And Sustaining The Process Of STI Enculturation In The Country

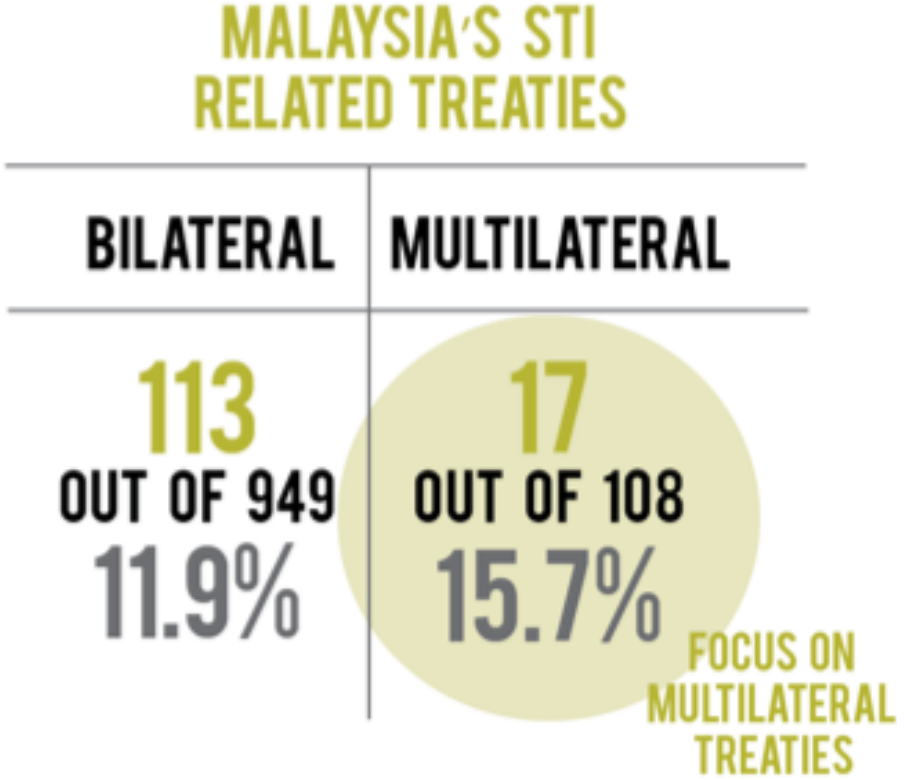
- A strategic long-term STI Enculturation Plan
- Develop STI Enculturation Index.


U6
Strategic International Alliance

6: International Alliance

Can Malaysia Tap into Global Opportunities through Strategic Collaborations in the STI Arena?

- Agreements need to translate to benefits related to STI development for Malaysia
- Attract strategic partners
- Effective positioning of Malaysia's STI competencies & capability



6: International Alliance

- Malaysia is a member of several high profile platforms (e.g. UN, OIC, Commonwealth, APEC, ASEAN, etc.) but not being leveraged for STI, very economic and politically driven
- Establish STI linkages with strategic regional & global partners – ASEAN, MIST and BRICS countries

ECONOMIES WHICH HOLD POTENTIAL IN TERMS OF REVENUE CONTRIBUTIONS

MALAYSIA'S POTENTIAL STI COLLABORATORS

Brunei, Thailand, Indonesia, Laos, Myanmar, Philippines, Cambodia

Brunei, Indonesia, Singapore

Laos, Singapore, Thailand, Vietnam, Myanmar

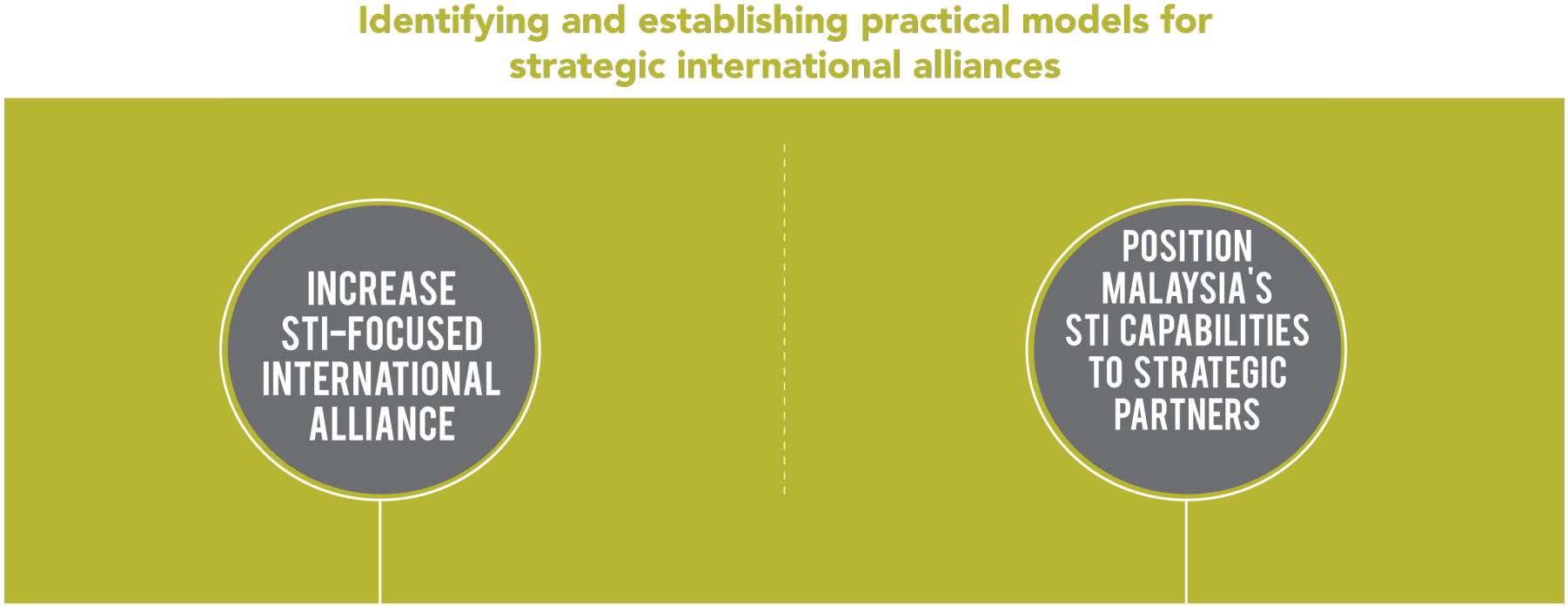
Cambodia, Singapore, Vietnam, Indonesia

Thailand, Cambodia

Philippines, Myanmar, Laos, Indonesia, Brunei

Myanmar, Singapore, Thailand, Vietnam

Sources: IMD 2014b; OECD 2013; WIPO 2014c



Identifying and Establishing Practical Models for Strategic International Alliances

- Strengthen STI-focused international alliances
  - Individual Country, Intra ASEAN, International levels
  - Position scientists as torch bearers to drive international scientific collaborations
- Attract strategic partners by projecting Malaysia's STI capacity and capabilities

What is the Way Forward?

Positioning STI:

- STI inputs and interventions are often seen as a prelude to policy development or a support for decision making but not part of the whole value chain of policy implementation
- STI must converge with economy and finance, geopolitics, society & culture to fuel a robust ideation process for socio-economic transformation
- Calls for transformative thinking, integrated planning & inclusive implementation

Thank you