Total National Capacity in STI for Socio-Economic Transformation - The National and Global Perspectives

Omar Abdul Rahman

Senior Fellow and Founding President, Academy of Sciences Malaysia (ASM)

Founding Fellow, Islamic World Academy of Sciences (IAS)

Fellow of the World Academy of Sciences (TWAS)

Chairman, Commonwealth Partnership for Technology Management (CPTM)

Formerly Science Adviser, Prime Minister's Department Malaysia

Original Article

ABSTRACT

STI may be a major enabler for national socio-economic change (SET). To function as such a set of STI Policy, Advice and Management Systems must be in place to optimise progress towards Total National Capacity (TNC) in STI. The overarching objectives of national SET is for a Harmonious, Prosperous, Progressive and Sustainable (HPPS) nation, achievable through deploying the four Critical Technologies for Basic Needs, Quality of Life/Environmental Sustainability, Economic Development/Industrial Competitiveness and Good Governance. Identifying the HPPS issues, securing and deploying the right technological solutions are subject to National Priorities determined through TNC in STI. The SDG's overall objective is a Global Socio-Economic Transformation for a Global HPPS, moreover requiring the application of the application of the four Critical Technologies. The HPPS and the four Critical Technologies are the common ground where Global Goals meet National Priorities; and where Goal 17 - Partnership for the Goals, global cooperation and collaboration can actually happen. Consideration to HPPS targets of national SET is a way developing countries can meaningfully contribute to the delivery of the SDG. Total National Capacity in STI could be a prerequisite to accomplishing national SET and contributing to global SET of the SDG. Pandemics readiness and capacity to respond must be a component of TNC in STI. A National STI Action Council is proposed as necessary for TNC in STI.

Received: 09 June 2020, **Accepted:** 15 August 2020

Key Words: National capacity, socio-economic, STI, strategy.

Corresponding Author: Omar Abdul Rahman, Senior Fellow and Founding President, Academy of Sciences, Malaysia,
E-mail: omar@akademisains.gov.my - tansriomar@gmail.com

INTRODUCTION

I am honoured by the invitation of the Egyptian Academy of Scientific Research and Technology to contribute an article in the inaugural issue of this journal. I will take this opportunity to discuss the concept of Total National Capacity in Science, Technology and Innovation, which comprises the principles and practices of an optimal STI policy and management capacity at national lavel, and to relate it to the major enabling role it plays in national socio-economic transformation and the global socio-economic transformation as demanded by the UN Sustainable Development Goals (SDG).

I will start by stating that the crucial role of science, technology and innovation (STI) as a major enabler for national socio-economic transformation (SET) alongside the political, economic and social enablers, cannot be over emphasised. China is an excellent example of how STI makes it a superpower ***(Wu, 2019)***, motivated and driven by Deng Xiaoping's 'The Four Modernizations Policy' of 1978, focusing on agriculture, industry, national defense and science and technology Also the role STI has played in the rapid and sustained economic growth of South Korea to become a developed nation within a single generation has been described ***(Choi, 2010)*** and are often cited. In comparison to South Korea, countries in South-East Asia are only classified as at institution building, catch up and post-catch stages ***(Ocon et al, 2013)***. Many other countries in the developing world are in similar suboptimal situation.

The Covid19 pandemic has reawakened both the developing and developed worlds of the need for vast

DOI: 10.21608/ARABSTI.2020.109331
Print ISSN: 2682 - 4310 / Online ISSN: 2682 - 4078
Volume 1, Number 1

improvement in the way we harness science and technology to address global challenges. The need to enhance the policy environment, to strengthen the S&T infrastructure and improve the management processes, ie the Total National Capacity (TNC) in STI, in order to support science-based decision making becomes priorities in all countries.

Resolving pandemics, however, is only one reason why enhanced STI capacity is required. For developing countries, it is required for enabling national SET, the current idiom for national development. Although all developing countries acknowledge the importance of STI for SET, an optimal STI system is seldom in place.

TNC IN STI FOR SOCIO-ECONOMIC TRANSFORMATION - THE NATIONAL PERSPECTIVE

1. SET and National Aspirations

National SET objectives and programmes are guided by national aspirations which are articulated variously as national vision, national development plan or national SET Programme.

Malaysia's national aspirations over the years are as follows:

Rukunegara (August, 1970), Vision 2020 (February, 1991), OneMalaysia concept (April, 2009), Transformasi National - TN 50 (January, 2017) and Shared Prosperity Vision 2030 (May, 2019). There is as yet no national aspiration statement from the current government, being fully occupied with fighting Covid19.

Whatever way the above versions of national aspirations are articulated, the overarching objectives of Malaysia's national aspirations has been summarised as aspiring to be a 'harmonious, prosperous, progressive and sustainable (HPPS) nation' ***(Omar, 2017)***; an aspiration that should not be an anathema to any political ideology.

The HPPS aspirations I believe is valid for all nations and can be the basis of a national SET strategy and programme for any nation. Let us examine in details the components of HPPS.

2. Components of, and Requirements for HPPS

HARMONIOUS: harmony is the most important factor; without peace and social harmony in a country, the prospect of disruption, displacement, destruction and death (the four dreadful Ds) is very real. There are three components to harmony, namely:

- The Socio-Cultural-Spiritual (SCS) components: the attitude and practice among citizens embracing respect, trust, transparency, tolerance and accommodation; compassion, empathy, goodwil and 'muhibbah'.
- Access to Basic Needs, eg food, water, shelter, energy, basic education, primary healthcare, gainful employment.
- Improving Quality of Life : higher level of basic needs, eg nutritious food, clean water, improved healthcare, quality education, gender equality, sustainable practices.

PROSPEROUS: prosperity is reflected in opportunities for personal improvement, equitable income distribution derived from a robust a high income, innovation driven, private sector led economy, healthy and productive lifestyle.

PROGRESSIVE: being an active part of the present and an influential part of the future on the global stage; being future aware and future ready.

SUSTAINABLE: an approach to sustainability through the ACCA +E framework : Awareness, Comprehension, Commitment, Action (actionable sustainable practices at all levels) and Evaluation.

Finally the overall requirement for HPPS is Good Governance and Responsible Government, and the overall enablers for HPPS, as have been stated earlier, are the political, economic, sociological and the technological.

3. The Technological Enablers for HPPS

It can be summarised that the technological enablers for HPPS are the Four Critical Technologies:

- Technologies for satisfying Basic Needs
- Technologies for improving Quality of Life, which shall include those for environmental sustainability and mitigating emergencies including pendemics.
- Technologies for Economic Growth and Industrial Competitiveness
- Technologies for Good Governance

It is to be remembered that issues of basic needs, quality of life, economic growth and industrial competitiveness and good governance are very country specific. Securing the appropriate sets of technologies, through the 'make some, buy some' strategy or other means, and deploying them are the function of National Priorities based on a national STI policy, advice and management framework. It is imperative therefore that a TNC in STI is in place.

4. The Total National Capacity (TNC) in STI

The elements of the above are summarised as follows:

- A government committed to providing a comprehensive STI physical and soft infrastructures
- A scientific and technological community, ethical and competent and able to contribute to and draw from the global pool of scientific knowledge and technological knowhow
- A private sector capable of creating wealth through the application of technology and innovation in both traditional and new sectors of the economy
- A society that is 'at ease with science', literate and

imbued with a culture of creativity, innovativeness and entrepreneurship

- An efficient governance system enabling effective policy making, planning, implementation and public debate and international collaborations that ensures long term commitment to STI development

An important element in the governance system is a subsystem of Science Advice which can be in the form of an advisory committee or a council, a parliamentary select committee, a learned society such as an Academy of Sciences, or a chief scientific adviser. However, the capacity for advice must be matched with the capacity to receive and act on good advice.

It is to be noted that the TNC in STI involves the four major stakeholders: the government, the scientific community, the private sector and the community at large. The support and involvement of the community with an active public debate on issues of STI in public life are essential for an optimal STI capacity supporting national SET agenda.

TNC IN STI FOR SET - THE GLOBAL PERSPECTIVE

5. SET and Global Aspirations

The UN Sustainable Development Goals (SDG), a blueprint for "a better and more sustainable future for all", is a Global Aspiration. It is labelled as ' UN Agenda 2030- Transforming Our World'. It can be interpreted as a global SET based on a global aspiration for sustainable development covering the "three dimensions of the economic, the social and the environmental". The objectives are therefore for a Harmonious , Prosperous, Progressive and Sustainable (HPPS) world; the same elements as HPPS at the national level, requiring the STI enablers of the Four Critical Technologies (for Basic Needs, Quality of Life, Economic Growth and Industrial Competitiveness and for Good Governance) ***(Omar, 2017)***, described above.

Indeed the technology requirements to deliver the 17 goals of the SDG can be summarised in the diagram below:

6. SDG 16 : Peace and Justice

Goal 16 "Promotes peaceful and inclusive societies for Sustainable Development, provide access to justice for all and build effective, accessible and inclusive institutions at all levels". It implies effective governance including the mitigation of conflicts and violence and preparedness for disasters including pandemics. It refers in fact to

The Four Critical Technologies for the SDGs

(Many Goals fit under more than one technology groups)

the Harmonious factor of the HPPS, which is the most important component of the global SET objectives of the SDGs. There are enough examples around world where conflicts and disharmony have led to the four Dreadful Ds (disruptions, displacement, destruction and death) resulting in zero chance for sustainable development. Measures to promote sustained and enduring harmony at the national level will therefore contribute to the delivery of Goal 16.

7. SDG 17: Partnership for the Goals

Goal 17 calls for international partnership, cooperation and collaboration (PCC) to develop, share and apply technologies and social organisations to deliver the SDGs. It has been posited ***(Omar, 2017)***, that in developing countries, because of capacity constraints, PCC can only happen where global goals coincide with national priorities, and the HPPS are the common ground for both global goals and national priorities. From the STI standpoint, opportunities for meaningful PCC are in the development and deployment of the Four Critical Technologies. Attention to the Four Critical Technologies in dealing with HPPS priorities for national SET will automatically contribute to HPPS for the global SET objectives of the SDG. Identifying national priorities and acquiring or developing and deploying the appropriate Critical Technologies at national level is, again, dependent on national TNC in STI.

TNC IN STI FOR PANDEMIC PREPAREDNESS

That Covid19 has reawakened the need for enhanced capacity to harness STI to deal with pandemics, has been mentioned at the beginning of this article. This does not refer to adhoc committees established to deal with immediate mitigation measures, but to permanent bodies responsible for pandemic preparedness and response. Developed countries usually have such units or agencies.

The US, for example, established in 2016, under the National Security Council (NSC), the Global Health Security Agency (GHSA) to strengthen 'the multilateral and multisectoral effort to detect and respond to new infectious disease threats' ***(Mendez, 2016)***. However the unit was reorganised in 2018 and the 'pandemic response team' as a unit was largely disbanded ***(Reuters, 2020)***. Additionally in America, there are a number of independent groups dealing with and advising governments on pandemics, such as the EchoHealth Alliance and the Forum on Medical Threats of the National Academy of Sciences, Engineering and Medicine.

In the U.K. there is SAGE, the government's Scientific Advisory Group for Emergencies that deals also with pandemics. There are also independent groups dealing with various aspects of pandemics. One example is the Rapid Assistance in Modelling the Pandemic (RAMP) Taskforce which is coordinated by the Royal Society. Recently the U.K. Government announced that it will create a Joint Biosecurity Centre “to bring together expertise and analysis to inform decisions in tackling Covid -19”. (***Institute for Government, 2020***)

At the global level there is the World Health Assembly with its International Health Regulations providing the international legal framework governing how WHO and its member states should respond to infectious disease outbreaks and requiring states to build capacities for and cooperate in dealing with pandemics (***Davis, 2020***). According to the Global Health Security (GHS) Index, which assesses countries’ health security and capabilities across a number of categories and indicators, “ collectively international preparedness for epidemics and pandemic remain very weak.” (***GHS Index, 2019***).

From the global perspective, pandemics come under SDG 3 (Good Health), SDG 16 (Peace and Justice) and SDG 17 (Partnership for the Goals).

As pandemics have serious consequences on public health and negative social, economic and political implications, it is imperative that bodies dealing with pandemic preparedness are constituted with a broad range of scientific disciplines and expertise. The expertise must be the various disciplines of science and medical sciences with public health at the core and must include modelling, behavioural science and public policy. To ensure public confidence and trust in the decisions made to combat pandemics, the advisory groups must be fully independent and transparent in their dealings. It is the perception of the lack of independence and transparency that led to the formation in the UK of a second alternative Independent SAGE (***Horton, 2020***).

Since viral pandemics will continue to be a 'clear and present danger' as many wild animals are sources of large numbers of viruses with the potential of causing deadly disease outbreaks and various forms of exploitation of wildlife continue, pandemic preparedness must be an integral component of the national TNC in STI.

GOVERNANCE SYSTEM FOR TNC in STI

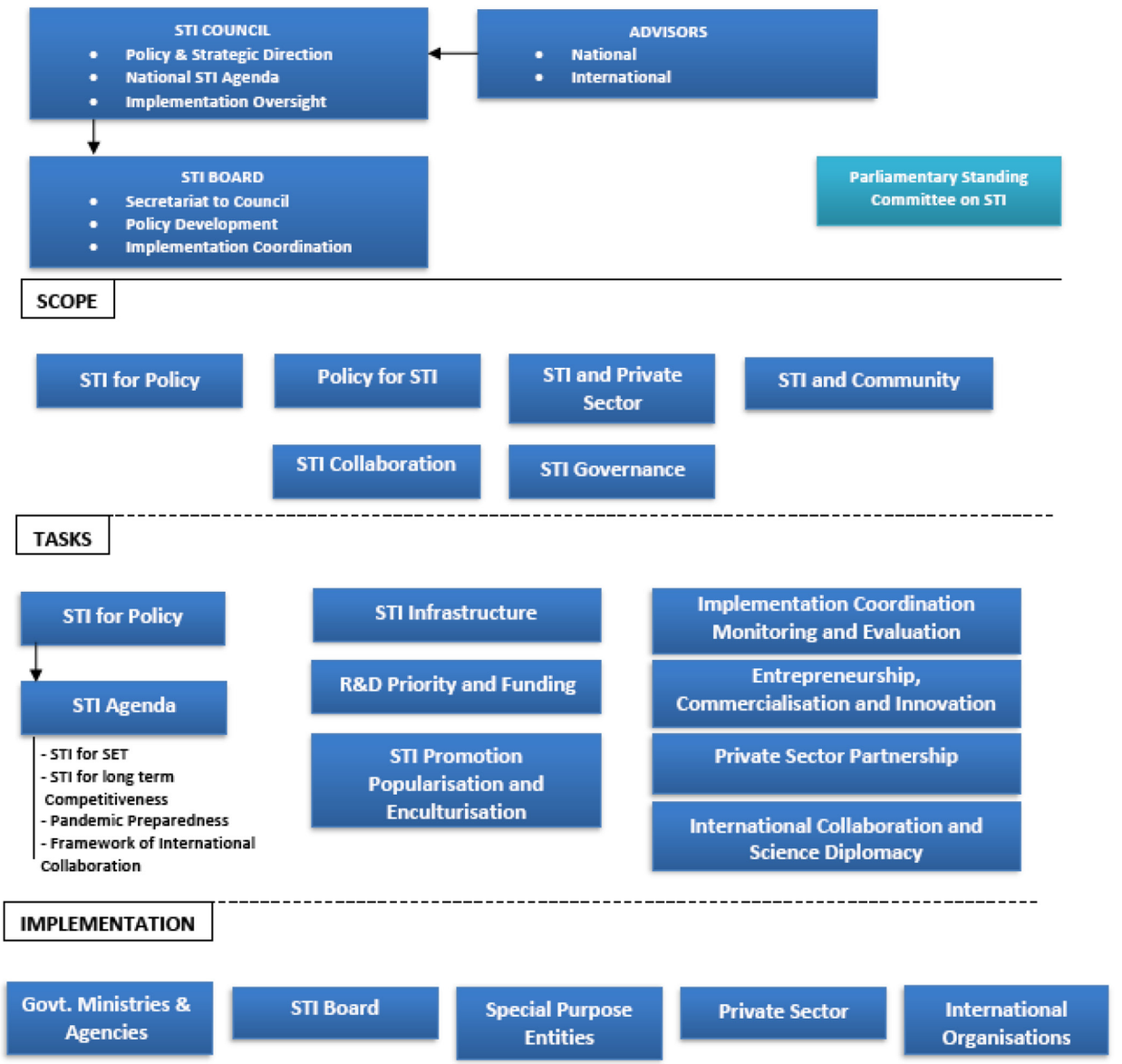
Establishing and ensuring an optimum TNC in STI require an effective governance structure, which must take into consideration the essential elements of policy, advice and management; and recognising the crucial role of STI across all the sectors of government. Reflecting the above consideration, I had proposed (***Omar, 2013***) a consolidated governance structure with a wide mandate for developing policy and strategic direction, the national STI agenda and implementation oversight. I am proposing now that this body be called the National STI Action Council with membership from both the public and private sectors. The head of state, as the supreme champion of STI, is to chair the Action Council.

The figure below represents the structure of this Action Council with the following updated tasks : identifying the STI components enabling the national SET Programmes (STI for Policy), consolidating the National STI agenda (Policy for STI), developing enabling framework for international collaboration (eg SDG);and pandemic

preparedness.

The above 'consolidated' structure, eliminating fragmentation of policy bodies across the the STI landscape, should provide the desired balance between the capacity to provide advice and the capacity to receive and act on good advice..

National STI Action Council



It must be remembered that the Action Council can only be as effective as the secretariat servicing it is competent. Therefore the STI Board, the secretariat to the Council, must be established with the legitimacy, authority and capacity to do its job efficiently.

CONCLUSIONS

- STI is a major enabler for national SET
- To function as such a set of STI Policy, Advice and Management Systems must be in place to optimise progress towards TNC in STI
- The overarching objectives of national SET is for a Harmonious, Prosperous, Progressive and Sustainable (HPPS) nation, achievable through deploying the four Critical Technologies for Basic Needs, Quality of Life/Environmental Sustainability, Economic Development/ Industrial Competitiveness and Good Governance
- Identifying the HPPS issues, securing and deploying the right technological solutions are subject to National Priorities determined through TNC in STI

- The SDG's overall objective is a Global Socio-Economic Transformation for a Global HPPS, also requiring the application of the four Critical Technologies.
- The HPPS and the four Critical Technologies are the common ground where Global Goals meet National Priorities; and where Goal 17 - Partnership for the Goals, global cooperation and collaboration can actually happen
- Attention to HPPS targets of national SET is a way developing countries can meaningfully contribute to the delivery of the SDG
- Total National Capacity in STI is a prerequisite to achieving national SET and contributing to global SET of the SDG
- Pandemics preparedness and capacity to respond must be a component of TNC in STI.
- A National STI Action Council is proposed as necessary for TNC in STI

REFERENCES

1. Choi, HS (2010): Korean Innovation Mode Revisited; STI Policy Review 1 (1), p 93-109.
2. Davis, SE (2020) : National Security and Pandemics; UN Chronicle;' 2020
3. Horton, R (2020) : Offline: Independent Science Advice for Covid19 - At Last; The Lancet, 395 (10245), p 1472.
4. Global Health Index (2019) : https://www.ghsindex.org/.
5. Institute for Government (2020): Joint Biosecurity Centre; instituteforgoverment.org.uk May 12, 2020.
6. Mendez, AP (2016): USAID's Bureau for Global Health, 2016
7. Ocon,JD et al (2013) : Lessons from Korean Innovation Model for Asian Countries towards a Knowledge Economy; wwwresearchgate.net /publication/ 263089141.
8. Omar, AR (2013) : The Essentials of STI Policy, Academy of Sciences Malaysia pub.
9. Omar, AR (2017) : Global Goals, National Action - Smart Partnership in STI for the SDGs; ASLI-CPPS/ CSO-SDG Alliance 4th RoundTable Policy Discussion on Harnessing STI for the SDG.
10. Omar, AR (2017) : Global Goals, National Priorities, Institutional Programmes -
11. A Framework for Action on the SDG; UCSI University Academic
12. Discourse on the SDG.
13. Reuters (2020) : Partly false claim: Trump fired entire pandemic response team in
14. 2018 ; Reuters Fact Check, March 26, 2020.
15. Wu, S (2019) : China - How Science Made a Superpower; Nature, 574, p 25-28.

الملخص العربى

القدرة الوطنية في مجال العلوم والتكنولوجيا والابتكار من أجل التحول الاجتماعي والاقتصادي - المنظور القومي والعالمي

عمر عبد الرحمن

زميل أول ورئيس مؤسس، أكاديمية العلوم الماليزية (ASM)
زميل مؤسس، أكاديمية العالم الإسلامي للعلوم (IAS)
زميل الأكاديمية العالمية للعلوم (TWAS)
رئيس شراكة الكومنولث لإدارة التكنولوجيا (CPTM)
مستشار علمي سابقًا، رئاسة مجلس الوزراء الماليزي

قد يكون العلوم والتكنولوجيا والابتكار عامل تمكين رئيسي للتغيير الاجتماعي والاقتصادي الوطني. للعمل على هذا النحو، يجب وضع مجموعة من سياسات وإدارة وأنظمة العلوم والتكنولوجيا والابتكار للمضي قدمًا نحو تحسين السعة الوطنية الإجمالية في مجالات العلوم والتكنولوجيا والابتكار. تتمثل الأهداف الشاملة للتحول الاجتماعي والاقتصادي الوطني في تحقيق أمة متناغمة ومزدهرة وتقدمية ومستدامة، ويمكن تحقيقها من خلال نقل الابتكارات الأساسية الأربعة للاحتياجات الأساسية، ونوعية الحياة / الاستدامة البيئية، والتنمية الاقتصادية / التنافسية الصناعية والحكم الرشيد. تحديد القضايا التنموية وتأمين وإرساء الحلول التكنولوجية الصحيحة تخضع للاحتياجات التي يتم تحديدها من خلال القدرات الوطنية في مجالات العلوم والتكنولوجيا والابتكار. الهدف العام للتنمية المستدامة هو التحول الاجتماعي والاقتصادي العالمي في تحقيق أمم متناغمة ومزدهرة وتقدمية ومستدامة، والتي تتطلب أيضًا تطبيق التكنولوجيات الأربعة الضرورية، حيث تعد أرضية مشتركة تلبي الأهداف العالمية للأولويات الوطنية؛ ويمكن تحقيق الهدف 17 - الشراكة من أجل الأهداف، والتعاون العالمي والتعاون في الواقع. ويُعد الاهتمام بأهداف أمة متناغمة ومزدهرة وتقدمية ومستدامة الخاصة بـالتحول الاجتماعي والاقتصادي الوطني طريقة يمكن للبلدان النامية من خلالها المساهمة بشكل مفيد في تحقيق أهداف التنمية المستدامة. يمكن أن تكون القدرة الوطنية الإجمالية في مجالات العلوم والتكنولوجيا والابتكار شرطا مسبقا للتحول على الصعيد الوطني والمساهمة في مجموعة أهداف التنمية المستدامة العالمية. يجب أن يكون التأهب للأوبئة والقدرة على الاستجابة أحد مكونات القدرة الوطنية في مجالات العلوم والتكنولوجيا والابتكار. ولتحقيق ذلك، يُقترح إنشاء مجلس نشاط وطني للعلم والتكنولوجيا والابتكار باعتباره ضروريًا للتحول الاجتماعي والاقتصادي الوطني في مجالات العلوم والتكنولوجيا والابتكار.