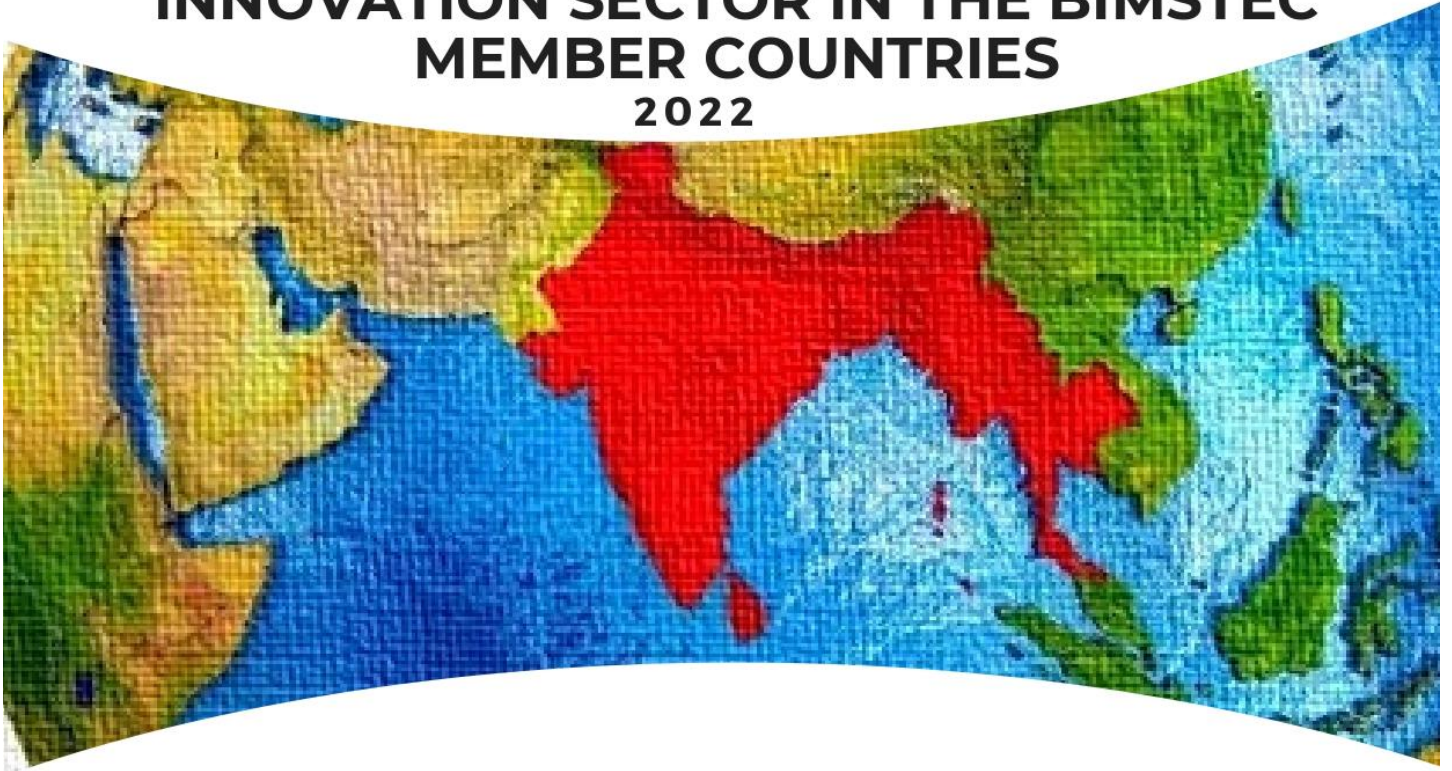




ASSESSMENT OF SCIENCE, TECHNOLOGY & INNOVATION SECTOR IN THE BIMSTEC MEMBER COUNTRIES 2022



National Science and Technology Commission of Sri Lanka

Ministry of Education
Government of Sri Lanka

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ACRONYMS

ABS	- Access and Benefit
ACC	- Annual Allowable Cut
AI	- Artificial Intelligence
AIF	- Agriculture Infrastructure Fund and Mission
AI-PF	- Artificial Intelligence - PetaFLOPS
API	- Active Pharmaceutical Ingredients
ASEAN	- Association of Southeast Asian Nations
BAMM	- BIMSTEC Ministerial Meeting on Agriculture
BCG	- Bacillus Calmette-Guérin
BCG	- Bio-Circular-Green Economy Model
BCSIR	- Bangladesh Council of Scientific and Industrial Research
BICOST	- Biennial Conference on Science and Technology
BIMSTEC	- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BioE3	- Biotechnology for Economy, Environment and Employment
BIRAC	- Biotechnology Industry Research Assistance Council
BITC	- Business Innovation and Technology Centre
BPO	- Business Process Outsourcing
BWC	- Biological Weapons Convention
CBU	- Completely Built-Up
CEIIC	- Clean Energy International Incubation Centre
CITIC	- China International Trust and Investment Corporation
CKD	- Completely Knocked Down
COVID-19	- Coronavirus Disease-2019
DBR	- Department of Biotechnology
DBT	- Department of Biotechnology
DCEZ	- Data Center Economic Zones
DGA	- Digital Government Development Agency
DHI	- Druk Holding and Investments
DITT	- Department of Information Technology and Telecom
DLAR	- The Department of Livestock and Aquaculture Research
DRI	- Department of Research and Innovation
DTVET	- Department of Technical and Vocational Education and Training

ECC	- Eastern Economic Corridor
EDB	- Export Development Board of Sri Lanka
EDP	- Entrepreneurship Development Policy
EE&C	- Energy Efficiency and Conservation
eGIDC	- Electronic Government Integrated Data Center
EGMAC	- Expert Group Meeting on Agriculture Cooperation
e-Gov	- Electronic Government
e-NAM	- Electronic National Agriculture Market
EPZ	- Export Promotion Zone
ESDM	- Electronic System Design and Manufacturing
EU27	- European Union, 27 member states
EU-CBRN	- European Union - Chemical, Biological, Radiological, and Nuclear
EV	- Electric Vehicle
FDI	- Foreign Direct Investment
Fiber GA	- Fiber Glass
FTWZ	- Free Trade Warehousing Zone
FY	- Financial Year
FYP	- Five Year Plan
GAHP	- Good Animal Husbandry Practices
GAP	- Good Agricultural Practices
GAqP	- Good Aquaculture Practices
GCI	- Global Competitiveness Index
GDC	- Government Data Center
GDP	- Gross Domestic Product
GEF	- Global Environment Facility
GII	- Global Innovation Index
GoSL	- Government of Sri Lanka
Govnet	- Government Network
GovTech	- Government Technology
GSM	- Global System for Mobile Communications
HDI	- Human Development Index
HESRI	- Higher Education, Science, Research and Innovation
HH	- Households
Hi-tech	- High Technology

ICDDR, B,	- International Centre for Diarrheal Disease Research, Bangladesh
ICS	- Improved Cooking Stove
ICT	- Information & Communications Technology
ICTA	- Information and Communication Technology Agency of Sri Lanka
IDCOL	- Infrastructure Development Company Limited
IE	- Industrial Estate
IEA	- International Energy Agency
IFPRI	- International Food Policy Research Institute
IMF	- International Monetary Fund
INDC	- Intended Nationally Determined Contribution
INR	- Indian Rupee
IoT	- Internet of Things
IPR	- Intellectual Property Rights
IPSAT	- International Partnerships for Science and Technology
IR	- Industrial Revolution
IRD	- Internal Revenue Department
ISP	- Internet Service Provider
ISU	- Implementation Support Unit
IT	- Information Technology
JICA	- Japan International Cooperation Agency
LEED	- Local Empowerment through Economic Development and Reconciliation
LMS	- Learning Management System
MIDH	- Integrated Development of Horticulture
MIMO	- Multiple-Input Multiple-Output
MoA	- Memorandum of Agreement
MOALI	- Ministry of Agriculture, Livestock and Irrigation
MoE	- Ministry of Education
MoH	- Ministry of Health
MONERC	- Ministry of Natural Resources and Environmental
MOOC	- Massive Open Online Courses
MOST	- Ministry of Science and Technology
MoU	- Memorandum of Understanding
MRTV	- Myanmar Radio and Television
MSME	- Micro, Small, and Medium Enterprises

MSO	- Multi-System Operator
MSR	- Myanmar Standard Rubber
MSS	- Myanmar Selection System
MSW	- Municipal Solid Waste
MTDI	- Mobitel Tower Development (Private) Limited
NASTEC	- National Science and Technology Commission of Sri Lanka
NCD	- Non-Communicable Diseases
NDI	- National Digital Identity
NESP	- National Education Strategic Plan
NFSA	- National Food Security Act
NGOs	- Non Government Organizations
NP	- Nagoya Protocol
NRDF	- National Research and Development Framework
NSM	- National Supercomputing Mission
NSTP	- National Science and Technology Policy
OBG	- Oxford Business Group
OSSC	- One Stop Service Centre
OSTP	- Overseas Training Programme
PAHAL	- Pratyaksh Hanstantrit Labh
PF	- PetaFLOPS
PGM	- Platinum Group of Mineral
PMFME	- Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme
PM-JAY	- Pradhan Mantri Jan Arogya Yojana
PMKSY	- Pradhan Mantri Kisan Sampada Yojana
PoA	- Plan of Action
PPP	- Public Private Partnership
R&D	- Research and Development
S&T	- Science and Technology
SAC	- State Administrative Council
SCFST	- Sub-committee on Food Science and Technology
SCI	- Science Citation Index
SCMST	- Sub-committee on Marine Science and Technology
SEZs	- Special Economic Zones
SGT	- Specific Goods Tax

SKD	- Semi-Knocked Down
SMART	- Sustainable, Modern, Accessible, Resilient, Technology
SME	- Small and Medium Enterprise
SOM-A	- Senior Officials on Agriculture
SREDA	- Sustainable and Renewable Energy Development Authority
STEAM	- Science, Technology, Engineering, Arts and Mathematics.
STEM	- Science, Technology, Engineering, and Mathematics.
STEPI	- Science and Technology Policy Institute
STI	- Science, Technology, and Innovation
STIP	- Science Technology Innovation Policy
STISP	- Science, Technology, and Innovation Strategic Plan
STP	- Science and Technology Policy
TK	- Traditional Knowledge
TKS	- Traditional Knowledge Systems
TRCSL	- Telecommunications Regulatory Commission of Sri Lanka
TVET	- Technical and Vocational Education and Training
UIO	- Unit in Operation
UMIS	- University Information Management System
UNCBD	- United Nations Convention on Biological Diversity
UNDP	- United Nations Development Programme
UNEP	- United Nations Environment Program
UNIDO	- United Nations Industrial Development Organization
UNSDG	- United Nations Sustainable Development Group
US	- The United States of America
USD	- United States Dollar
USDA	- United State Department of Agriculture
VAT	- Value Added Tax
VoIP	- Voice over Internet Protocol
WASH	- Water Supply, Sanitation and Hygiene
WIPO	- World Intellectual Property Organization
WITS	- World Integrated Trade Solution

FOREWORD

The National Science and Technology Commission of Sri Lanka (NASTEC) is honored to present this foreword for the momentous endeavor undertaken by the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC). During the Seventeenth BIMSTEC Ministerial Meeting, held virtually from Colombo, Sri Lanka, in 2021, a significant decision was made to establish an Expert Group on Science, Technology, and Innovation (STI) Cooperation. This group was tasked with preparing an Action Plan/Work Programme aimed at strengthening collaboration in the STI sector across BIMSTEC countries.

The establishment of this Expert Group marks a crucial step forward in encouraging a robust Science, Technology, and Innovation system within the BIMSTEC region. As per the action plan, the first goal of the initiative is to develop a vibrant Science, Technology, and Innovation (STI) culture across BIMSTEC countries, and to share and expand knowledge and know-how in technology and application for the sustainable development of the economy and lifestyle of the people of BIMSTEC region. One of the key activities under this initiative is to carry out a comprehensive assessment of the Science, Technology, and Innovation sectors across BIMSTEC member countries. The expected output of this activity is the publication of the “Assessment of Science, Technology, and Innovation Sectors in BIMSTEC Countries,” which will be made available on the BIMSTEC website.

This publication will serve as a foundational document, providing valuable insights to all stakeholders involved. It will facilitate informed decision-making and policy formulation, thereby enabling each member country to encourage the full potential of Science, Technology, and Innovation for sustainable development, reflecting the shared commitment as a collaborative effort of all BIMSTEC countries.

As we move forward with this strategy, we are assured that the collective efforts of the BIMSTEC countries will lead to remarkable advancements in the STI sector. We look forward to witnessing the positive impacts of this collaboration, which will undoubtedly contribute to the prosperity and well-being of our region.

The National Science and Technology Commission of Sri Lanka (NASTEC) is the leading advisory body to the Government of Sri Lanka (GoSL) on evidence-based policymaking within the Science and Technology (S&T) domain. On behalf of NASTEC, we extend our heartfelt gratitude to all the member states, experts, government officials and stakeholders who have contributed to this undertaking. Together, we are paving the way for a brighter, more innovative future for the BIMSTEC community.

National Science and Technology Commission of Sri Lanka,
Ministry of Education
Sri Lanka

June 28, 2024

EXECUTIVE SUMMARY

In the BIMSTEC countries, the science, technology, and innovation sector plays an essential role in promoting sustainable development, economic cooperation, and regional growth. Assessments in 2022 of global innovation, competitiveness, and human development provide valuable insights into the progress and future pathways for these nations. The BIMSTEC countries exhibit diverse but significant developments related to science, technology, and innovation, as displayed by their Global Innovation Index (GII) rankings, Global Competitiveness Index (GCI) rankings, Human Development Index (HDI) rankings, and significant policy initiatives.

Bangladesh, positioned at 102nd in the Global Innovation Index (GII), exhibits notable improvement, particularly in innovation outputs, indicating its commitment to technological advancements. India, securing the 40th spot in the GII, showcases advancements in both innovation inputs and outputs, highlighting its dedication to supporting institutional frameworks. Nepal ranks 111th in the GII, with stronger performance in innovation inputs (106th) than outputs (111th), supported by key policies such as the National STI Policy 2019 and the National Biotechnology Policy 2006. Its HDI value in 2022 is 0.602, ranking 143rd globally, and its high-tech exports were \$3.3 million in 2022. Notable programs include the One Province One SEZ initiative. Myanmar and Sri Lanka also demonstrate growth in innovation, with Myanmar at 116th and Sri Lanka at 85th in the GII rankings, indicating their efforts to foster innovation ecosystems. Thailand maintains a steady position in innovation, reflecting continued efforts to drive productivity and competitiveness.

In the Global Competitiveness Index (GCI) 2022 rankings, Bangladesh holds a prominent position, indicative of its efforts to enhance national competitiveness. India's significant progress, climbing to the 37th rank, underscores its commitment to improving institutional frameworks and productivity factors. Sri Lanka's positive growth in competitiveness emphasises ongoing efforts in this regard. While detailed data for Thailand in 2022 is unavailable, its commitment to competitiveness remains evident, likely focusing on refining institutional frameworks and policies.

Regarding the Human Development Index (HDI) 2022 rankings, significant progress is noted in Bangladesh, placing it at 129th, reflecting substantial improvement. Bhutan closely follows at 127th, emphasising consistent growth. India's steady advancement places it at 132nd, while Myanmar's moderate human development is reflected in its 2021 HDI ranking at 149th. Sri Lanka, ranked 73rd, and Thailand, ranked 66th, stand out with high human development status, underscoring their dedication to societal well-being.

Across the BIMSTEC region, each country adopts distinct strategic approaches to advance its STI ecosystem, ideal for its unique priorities and developmental goals. These diverse approaches collectively contribute to the region's progress and foster collaboration towards shared technological advancement and sustainable development goals.

INTRODUCTION

The “Assessment of Science, Technology, and Innovation Sectors in BIMSTEC Member Countries, 2022” represents a significant milestone in our collective efforts to enhance cooperation and development within the region. As outlined in the action plan, the primary goal of this initiative is to encourage a vibrant Science, Technology, and Innovation (STI) culture across BIMSTEC countries. This involves the sharing and expansion of knowledge and technological know-how to promote the sustainable development of economies and the improvement of lifestyles for the people of BIMSTEC.

The BIMSTEC region comprises a combined population exceeding 1.5 billion people, highlighting significant human capital and global influence potential. This collaboration strengthens member capabilities and positions BIMSTEC as a key player in the Asian geopolitical region, consuming strategic location and economic strength. Together, BIMSTEC aims to promote stability and growth in the Bay of Bengal region, contributing to broader regional and global stability through mutual cooperation and shared objectives.

In exchange, one of the cornerstone activities of this initiative has been to conduct a comprehensive assessment of the STI sectors across BIMSTEC member countries. This thorough evaluation aims to provide a detailed and accurate picture of the current state of STI in each country. The outcome of this activity is enclosed in the publication of the “Assessment of Science, Technology, and Innovation Sectors in BIMSTEC Member Countries,” to be shared on the BIMSTEC website.

In 2024, Sri Lanka would have been honoured to be the host country for this crucial undertaking. The National Science and Technology Commission of Sri Lanka (NASTEC) has taken the lead in compiling this assessment report. The report provides an extensive overview of the current conditions within each BIMSTEC country, including detailed profiles on the Human Development Index (HDI), Global Innovation Index (GII), Global Competitive Index (GCI), Science, Technology, and Innovation (STI) policies, indigenous resources, ICT infrastructure, etc.

While compiling this assessment report, all the data included was sourced directly from the respective BIMSTEC countries. It is important to note that some data is missing, and no information has been altered from our end to ensure the authenticity and accuracy of the report.

We believe this comprehensive assessment will serve as a foundational document, offering valuable insights and facilitating informed decision-making and policy formulation. This will enable each member country to fully encourage the potential of science, technology, and innovation (STI) for sustainable development. We are confident that the collective efforts of the BIMSTEC countries, guided by the findings of this report, will lead to significant advancements in the STI sector, contributing to the prosperity and well-being of the region.



BANGLADESH

Global Innovation Index- Bangladesh

Bangladesh ranks 102nd among the 132 economies featured in the GII 2022. The Global Innovation Index (GII) ranks world economies according to their innovation capabilities. Consisting of roughly 81 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation.

The following table shows the rankings of Bangladesh over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Bangladesh in the GII 2022 is between ranks 93 and 110.

Rankings of Bangladesh (2020–2022)

Year	GII	Innovation inputs	Innovation outputs
2022	102	112	90
2021	116	121	113
2020	116	119	114

- Bangladesh will perform better in innovation outputs than innovation inputs in 2022.
- This year Bangladesh ranks 112th in innovation inputs, higher than last year 2021, and compared to 2020.
- As for innovation outputs, Bangladesh ranks 90th. This position is higher than last year and 2021 compared to 2020.

In 2022:

20th Bangladesh ranks 20th among the upper middle income group economies.

8th Bangladesh ranks 8th among the 10 economies in South East Asia, East Asia and Oceania.

Global Competitiveness Index 2022 ranking – Bangladesh

Covering economies, the Global Competitiveness Index 4.0 measures national competitiveness—defined as the set of institutions, policies, and factors that determine the level of productivity.

Rank	Economy	Score	Diff. from 2021	
			Rank	Score
..... 2020	Bangladesh	50.8		

Source: The Global Competitiveness Report, SPECIAL EDITION 2020 by World Economic Forum.

Human Development Index 2022 ranking - Bangladesh

Bangladesh's HDI value for 2022 is 0.661 - which puts the country in the medium human development category - positioning it at 129 out of 189(/191) countries and territories. The rank is shared with Between 1990 and 2021, Bangladesh's HDI value increased from 0.397 to 0.661, an increase of 66.50 percent.

Country	Year	Index	Rank
Bangladesh	2022	0.661	129

National STI Policies in Bangladesh

The government of the People's Republic of Bangladesh formulated a list of national policies for several specialized scientific and technological fields for research, development, innovation, and invention for the betterment of the citizens of Bangladesh and the globe. The following sub-sections sequentially and concisely describe these policies.

National Science Technology and Innovation (STI) Policy and Plan

Ministry of Science and Technology, Government of the People's Republic of Bangladesh formulated its latest National Science and Technology Policy in 2011. This policy led the country to establish a systematic research culture, such as by creating a significant number of research and development (R&D) organizations, including research institutes, laboratories, and universities, to increase the number of researchers and scientists, to increase their training and facilities those were not seen previously in Bangladesh. Furthermore, after formulating and implementing this policy, better research outcomes have been observed in Bangladesh. For example, according to the Scopus database, only 2499 research papers were published in 2010, but in 2022, this number increased to 13,396.

Bangladesh has made significant strides in recent years towards building a robust and vibrant science, technology, and innovation (STI) ecosystem. This progress is underpinned by a series of comprehensive policies aimed at fostering research, development, and technology adoption across various sectors. Here, we highlight some key policy instruments shaping the STI landscape of Bangladesh:

1. National Science and Technology Policy 2011: This flagship policy lays out a long-term vision for harnessing STI for sustainable development. Its key objectives include:
 - Strengthening the national research and development (R&D) system
 - Promoting innovation and entrepreneurship
 - Building human capital in science and technology
 - Creating a conducive environment for technology transfer and commercialization

The policy emphasizes sector-specific interventions in areas like agriculture, health, education, and information technology. It also calls for increased public-private partnerships and international collaboration in STI activities.

2. National Innovation and Intellectual Property Policy 2018: Recognizing the crucial role of innovation in driving economic growth, this policy aims to create a supportive environment for fostering creativity and ingenuity. Key features include:
 - Establishing a National Innovation Council to spearhead innovation initiatives
 - Promoting technology incubation and acceleration programs
 - Strengthening intellectual property (IP) rights protection and enforcement
 - Fostering technology adoption and diffusion across industries

The policy emphasizes the importance of building a culture of innovation, encouraging risk-taking, and providing support to innovators at all stages of the entrepreneurial journey.

National Nanotechnology Policy Framework

The National Science and Technology Policy 2011 (NSTP 2011) provides a strong foundation for integrating nanotechnology development and applications into the nation's future. The policy explicitly encourages research and development (R&D) in "new and emerging technologies," including nanotechnology. This provides a broad mandate for supporting nanotech initiatives by setting up a dedicated research center.

National Biotechnology Policy Framework

Ministry of Science and Technology, Government of the People's Republic of Bangladesh formulated its National Biotechnology Policy - 2012. The National Institute of Biotechnology and several research organizations, including Bangladesh Atomic Energy Commission (BAEC), Bangladesh Council of Scientific and Industrial Research (BCSIR), ICDDR, B, etc., and all private pharmaceutical companies and universities of Bangladesh are currently following this policy.

Biotechnology is one of the most important scientific and technological revolutions affecting human life. The Government of Bangladesh has already gazetted 'National Biotechnology Policy 2012' and 'National Biotechnology Policy 2012 Action Plan 2014' to promote biotechnology education, research, and industrialization. Currently, the country has a significant number of research institutes, public and private universities, and private institutions involved in biotechnology research, education, human resource development, and business. The 'National Biotechnology Policy Action Plan' has been formulated by identifying short, medium- and long-term strategies for the implementation of the National Biotechnology Policy to address future challenges including food security and sustainable environmental management, capacity

building on biotechnology for our national development. Actions for achieving sustainable development in various branches of biotechnology are included in the short, medium, and long term. To meet the challenges of the fourth industrial revolution and build a smart Bangladesh by 2041. The draft The Draft National Biotechnology Policy 2024 and its accompanying National Biotechnology Policy 2024 Action Plan have been formulated, which represent Bangladesh's strategic roadmap to harness biotechnology for sustainable development, food security, public health, environmental resilience, and industrial production. These documents align with global best practices while addressing national priorities.

The NSTP 2011 acknowledges the transformative potential of biotechnology in revolutionizing healthcare, agriculture, and environmental sustainability by:

- Strengthening research infrastructure: Funding research institutions, universities, and private sector collaboration to create a thriving ecosystem for biotechnology innovation.
- Prioritizing capacity building: Investing in training programs and skills development initiatives to equip a skilled workforce of Bangladeshi biotechnologists.

Food and Agriculture

National Food and Nutrition Security Policy Plan of Action (2021-2030) emphasizes technology adoption for sustainable food production, precision agriculture, and post-harvest management.

The National Science and Technology Policy 2011 of Bangladesh explicitly aims for self-reliance in food and agriculture, fostering R&D in climate-smart technologies, nuclear and complementary/allied technologies, resource efficiency, and local adaptation to ensure sustainable food security, environmental responsibility, and improved well-being for all citizens

Medicine and Health

National Science and Technology Policy 2011 prioritizes three key areas: nutrition and family well-being, cutting-edge biotechnology, and affordable pharmaceuticals and herbal remedies and nuclear techniques concerning medicine and health. By tackling both traditional and modern approaches to healthcare, this policy aims to reduce disease, improve access to vital medical services, and ultimately lead to a stronger, healthier future for all Bangladeshis.

National Energy Policy Framework

The framework emphasizes on promoting energy transition towards climate neutrality in line with international commitments - developing new, sustainable and renewable forms of energy including, wind, solar and sustainable biofuels and biomass as well as fusion energy (the most powerful renewable energy sources).

The implementation of the sustainable power and energy has achieved considerable success. Under Sustainable Power and Nuclear Energy, Bangladesh has the NPP, Research Reactor (in BAEC), and Institute of Energy Science (in BAEC). Bangladesh has already achieved the milestone of full electrification rate in the year 2022. Bangladesh is confident in further progress to attain the ‘Clean energy for everyone: Secure access to affordable, reliable, sustainable and modern energy for everyone’.

Technical Cooperation is desired in the enhancement of national capacities in implementing the Energy Programme, (i) enhancement of national capacities of regulators in supervising NPP commissioning and operational phases, (ii) enhancement of national capacities in operational safety and security of the research reactor in BAEC, human resource development (including expert service) for the establishment of a “High Power Multipurpose Research Reactor”, (iii) enhancement of national capacities in nuclear fusion energy research.

Bioenergy

Bioenergy in Bangladesh comes from biomass and biogas technology. Biomass fuels include wood, cow dung, leaves, twigs, and agricultural residues such as straw and husk, which are locally gathered and are some of the primary sources of fuel for cooking purposes. Among the total energy consumption in Bangladesh, bioenergy contributes approximately 70%. BCSIR developed an Improved cooking stove (ICS) and tried to popularize ICS among the country, and several universities are conducting R&D to increase energy efficiency and cost-reduction of these technologies. SREDA, IDCOL, and many NGOs are disseminating knowledge and technology regarding biomass technology throughout the country.

Environment, Soil, and Water Resources

The National Science and Technology Policy 2011 identifies fields where solutions are likely to have a significant impact on the economic and socio-cultural development of the country. Environment, Soil, and Water Resources are issues of utmost importance. The evidence from global experience, as well as the experience from Bangladesh, suggests that climate change is a real threat to global and national-level prosperity. The environmental quality of Bangladesh is degrading severely with rapid economic growth of the country. Rapid development processes, anthropogenic activities, and the changing climate have created serious strain on environmental quality and pollution issues.

In the case of water pollution, the scenario is very alarming. Pollution from industries, agricultural activities, sewerage, ships, and trans-boundary sources are making the rivers increasingly polluted day by day. Soil degradation is another major environmental concern, and it is closely linked with water pollution.

It is possible to assess riverbank erosion processes, spatial distribution, and temporal dynamics for land management strategy to prevent and reduce flood and riverbank erosion using nuclear techniques like Fallout Radionuclides (FRN), Compound Specific Stable Isotope (CSSI) analyses methods, and water isotopes for soil moisture assessment.

Technical cooperation is required in “strengthening national capacities in nuclear techniques for climate change and environmental pollution monitoring in the country”; “improving capacities in surface and ground water resources development and management for all people within the country”; “enhancing national capacities in developing adaptation strategies on salinity intrusion for the people in coastal region of Bangladesh” and “enhancing analytical capacity for isotope biogeochemistry of soils, water, and air in the country”.

Bio-based Industry

The bio-based industry aligns with the principles of sustainability and the circular economy by minimizing waste, reducing greenhouse gas emissions, and promoting the efficient use of resources.

The bio-based industry in Bangladesh, such as biotechnology, is emerging as a beacon of sustainable progress, where the cultivation of bio resources not only fuels economic development but also fosters a harmonious coexistence with the environment. Several pharmaceutical and biotech companies, including Incepta, Globe Biotech, Drug International, Beximco, etc., are currently manufacturing a list of vaccines, viz. Tetanus BCG, COVID-19, Hepatitis-B virus, Polio, Pox, Snake venom antiserum, Cholera, Influenza type-A virus, Rabies, Typhoid polysaccharide, Measles and Rubella vaccine, etc. On the other hand, the bioenergy-based industry is a mature and widely disseminated technology. Besides these technologies, many bio-based industries in Bangladesh are developing a list of bio-products such as bio-pesticides and neem-pesticides. The government of Bangladesh has already undertaken a list of policies and projects to foster and enhance these industries. However, rooted in innovation and guided by a commitment to ecological balance, this industry in Bangladesh exemplifies a transformative journey towards a greener, more resilient future.

Marine Technology

Blue Economy Focus and Policy Development: Bangladesh continued its strong emphasis on the "Blue Economy" as a key driver for sustainable development. This involves leveraging its extensive coastline (710km) and Exclusive Economic Zone (EEZ) of 118,813 sq. km. The government has formed high-level committees to maximize blue economy opportunities and identified sectors like marine fisheries, Mari culture, offshore energy, and blue biotechnology under its national blue economy development work plan. This commitment underscores the need for robust ocean technology and scientific research.

- **Marine Aquaculture Development:** There's a growing interest and ongoing research into marine aquaculture and Mari culture to diversify marine food production and reduce pressure on wild fish stocks. This includes exploring the potential for seaweed cultivation and integrated multi-trophic aquaculture.
- **Policy and Regulatory Framework:** While the Blue Economy concept is strong, a comprehensive and integrated policy framework for ocean governance that fully incorporates modern ocean technology and sustainable practices is still evolving in Bangladesh.
- **Technology Transfer and Adoption:** Ensuring the effective transfer and adoption of advanced ocean technologies, especially from international partners, remains a challenge, as does building local capacity to maintain and innovate these technologies.

By integrating these specific points about Bangladesh's ocean technology landscape, the assessment will offer a more comprehensive and nuanced picture of the STI sector within the BIMSTEC context for 2022.



BHUTAN

Human Development Index 2022 ranking - Bhutan

Bhutan's HDI value for 2021 is 0.67 which puts the country in the medium human development category— positioning it at 127 out of 191 countries and territories. In 2020 and 2021, Bhutan's HDI value increased from 0.65 to 0.67, an increase of 0.02 percent.

Country	Year	Index	Rank
Bhutan	2021	0.67	127

National STI Policies in Bhutan (National Science Technology and Innovation (STI) Policy and Plan)

Bhutan doesn't have a policy on STI, however realizing the potential, prioritizes the development of the STI sector. The STI Initiative in Bhutan is expected to bring on new economic opportunities apart from developing an environment for new technology and knowledge transfer, market driven innovation and promotion of academic industry linkage, and R & D works. The Government Technology (GovTech) agency under the Royal Government of Bhutan takes major lead in implementing the digital initiative across the country. One of the major initiatives planned in 13th FYP is the establishment of STI Park. The STI Park will be built with all the facilities meeting the international standards. Programs on STI is aimed to stimulate the digital economy through commercialization of innovative products and services in science and technology while focusing on specific areas of developing professional skills in Bhutan, and build local capacity and capability, startup hubs for the global and local startups, create high value employment opportunities and tech innovation through R&D services.

Hi-tech exports in Bhutan

There is no formal data of tech exports in Bhutan however, the country has been able to attract few FDI companies that provide services to the global clients. Today, there are 25 FDI tech companies that are operating from the country. The country is in an effort to develop the overall tech ecosystem including the growth of the local tech industry. Several initiatives are underway that will support and promote the development of Bhutanese tech products and services and make its presence in the global market.

High Tec Imports BHUTAN				
Year	Value in Nu.(Million)	Avg. Exchange rate	Value in USD(Million)	Change%
2023	11.62	83.19	139.59	-52.2
2022	22.97	78.60	292.29	+86.3
2021	2.99	74.48	40.12	-71.6
2020	10.35	73.39	141.03	-

List out Special Economic Zones, Tax details, adoption of digital technology details

Having identified ICT as a priority sector for the development of a knowledge-based economy, the erstwhile Department of Information Technology & Telecom of the Ministry of Information & Communications now named as the Government Technology Agency established Bhutan first ever IT Park with support from the World Bank. The IT Park was established with objective to create productive employment in the sector and increase GDP contribution from ICT sector through promotion of FDI investment, strengthening ICT industry the country and developing entrepreneurship culture and startups in the tech sector.

The operations of the IT Park started on 7th May 2012 and is operated by Thimphu TechPark. Today, it provides two major services i) facilitating FDI business in Bhutan and leasing commercial space to both domestic and foreign companies; ii) Business Innovation and Technology Centre (BITC) provides business incubation services to startups, shared technology services and data center services. The BITC has been one of the pioneers in introducing entrepreneurship culture in the country. Around 100 entrepreneurs have graduated from BITC in the past 10 years turning their idea into reality. Most of them have launched their products and services operating from the incubation center.

Thimphu TechPark launched the ‘Centre of Excellence for Information Technology’ on 21st February, 2020. Today, the Park serves major clients including the government agency in developing software applications and providing tech solutions using the latest technologies block chain, AI and others. The InnoTech Department under DHI operates Jigme Namgyel Wangchuck Super Fab Lab that provides an open platform for learning and innovation inside the park.

The startup centre was launched in 2018 to create an enabling environment for entrepreneurs to work on their business ideas. The centre is operated and managed by the Department of Employment and Entrepreneurship under the Ministry of Industry, Commerce and Employment. The centre provides co-working space, mentoring, training, product development, marketing and other business support.

Tax details

The fiscal incentives Act of Bhutan 2021 provides direct and indirect tax and sector specific exemptions to investors.

Direct Tax Incentives: Newly established ICT businesses will enjoy a concessionary tax rate of 5 % during the qualifying period of up to 5 years.

Indirect Tax Incentives: Sales tax and customs duty on plant & machinery, construction material, ICT tools and equipment are also granted to IT service providers such as software development entities, BPO, MSO, Cable Operators and any other IT service providers.
ST and CD exemption on Research and Development equipment for Government recommended Research and Development proposal;

National development policies connected to technology and industry in Bhutan

Following are the policies connected to technology and Industry;

1. Information, Communication and Media Act of Bhutan
2. Bhutan Telecommunication and Broadband Policy
3. e-Gov Policy
4. FDI Policy
5. EDP Policy

ICT infrastructure and connectivity in Bhutan

The GovTech, Royal Government of Bhutan prioritised ICT to achieve the vision of becoming an ‘A technologically advanced nation, with empowered citizens and a thriving digital economy’. To this end, the government is taking a concerted effort in leveraging technologies for digital transformation of the country. One of the major achievements was in establishing the infrastructure for mobile network coverage in all the villages across the country. As of July 2021, 94% of the households in the country have access to the Internet (as per ICT baseline survey 2021 conducted by DITT). Community Centers in the gewogs were built for the digitally disadvantaged citizens to gain access to ICT infrastructure, information, and services. All the government agencies have been connected to the Government Network (Govnet) with a faster and reliable network to facilitate the delivery of public services. A total of 160 public services of various government agencies were identified and automated.

To make connectivity more affordable, accessible, and reliable, the Royal Government of Bhutan (RGOB) has extended fiber infrastructure to the sub-district level. Both OPGW (Optical Ground Wire) and ADSS (All-Dielectric Self-Supporting) fiber connections have been established, covering all 20 districts and 204 sub-districts. In a bid to promote service expansion into rural and underserved areas, the fiber cores are leased to internet service providers at no cost. This initiative aims to bridge the digital divide and ensure that even the most remote regions of the country have access to digital services.

Recently, GovTech also launched the National Digital Identity (NDI) that uses a decentralised self-sovereign identity framework empowering every citizen authority over their own data. With this platform, it positions Bhutan uniquely in the global arena for innovation in the national digital identity field. The platform also opens a plethora of innovative opportunities in the digital space for businesses while ensuring the safety and privacy of personal data.

Bhutan's first Government Data Center (GDC) was established and commissioned on March 23, 2017. After successfully establishing the required infrastructure, GDC was operationalised with 20 critical government systems. Today, the numbers have exceeded 150 systems and are still growing. The current infrastructure setup provides storage, compute and network resource pools, which ensures optimisation to a certain extent.

Conclusion

Bhutan is making significant strides in enhancing its human development value and technological landscape. The Government Technology(GovTech) agency under the Royal Government of Bhutan leads the digital transformation initiative of the country and these efforts are designed to stimulate the digital economy, develop professional skills, and support local startups, ultimately creating high-value employment opportunities and advancing Bhutan's technological landscape. These efforts not only aim to boost economic opportunities but also strive to empower citizens and enhance overall quality of life through technology.

The Science Technology and Innovation sector is a priority with the government's commitment to fostering the sector, alongside initiatives like the establishment of Thimphu TechPark, Bhutan Innovation & Technology Center and the investment in various digital infrastructure projects and regulatory environment, highlights its ambition to build a robust STI ecosystem and ultimately cultivate a knowledge-based economy. The National Digital Strategy 2024 further highlights the vision of becoming an 'Intelligent Bhutan' prioritizing STI for digital transformation of the nation. This strategy will drive the overall growth of the STI sector in the coming years.



INDIA

Global Innovation Index- India

India retains 40th rank in the Global Innovation Index 2022 rankings among the 132 in the Global Innovation Index (GII) 2022. India has been on a rising trajectory, over the past several years, from a rank of 81 in 2015 to 40 in 2022. Innovation has been at the forefront of our battle against the unprecedented crisis created by the pandemic and will be pivotal in driving the country's resilience, as enshrined call on Atma Nirbhar Bharat. Consisting of roughly 80 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation.

The following table shows the rankings of India over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of India in the GII 2022 is between ranks - and –

Rankings of India (2020–2022)

Year	GII	Innovation inputs	Innovation outputs
2022	40	42	39
2021	46	57	45
2020	48	57	45

- India performs better in innovation outputs than innovation inputs in 2022.
- This year India ranks 40nd in innovation inputs, higher than both 2021 and 2020.
- As for innovation outputs, India ranks 39th. This position is higher than both 2021 and 2020.

In 2022:

1st India ranks 1st among the 36 lower-middle-income group economies.

1st India ranks 1st among the 10 economies in South East Asia, East Asia, and Oceania.

Global Competitiveness Index 2022 ranking – India

India's Performance in the World Competitiveness Index 2022. India jumped from the 43rd rank in 2021 to the 37th rank in 2022 on the World Competitive Index.

Covering 141 economies, the Global Competitiveness Index 4.0 measures national competitiveness- defined as the set of institutions, policies and factors that determine the level of productivity.

2022			Diff. from 2021	
Rank	Economy	Score	Rank	Score
37	India	-	42	-

Human Development Index 2022 ranking - India

India's Human Development Index (HDI) has increased significantly since 1990. However, it is still below the global average. India's HDI is ranked 132 out of 191 countries and territories in the 2021/2022 Human Development Report

India's HDI value for 2022 is 0.633 which put the country in the medium human development category positioning it at 132 out of 191 countries and territories.

Country	Year	Index	Rank
India	2022	0.633	132

National STI Policies in India

India adequately prioritizes and strategizes across the STI landscape in alignment with UNSDG goals through a balance of short-term mission mode programmes along with long term ones. There are following Policy debates happening in India to address the societal challenges.

- Intensified global and local linkages in the STI sector.
- Development of indigenous technologies in key areas such as health, agriculture, energy, environment etc. in alignment with the needs of the local communities.
- To facilitate seamless knowledge flow across the stakeholders (government including Centre and State, R&D institutions, academia, enterprises-industry, start-ups and Small and Medium Enterprises and society) of the STI ecosystem to enhance the applicability of R&D and technology development outcomes including the tangible impact of S&T on society.
- To catalyse innovation and value creation in the system with due importance given towards recognition, incentivization and promotion of Traditional Knowledge Systems (TKS) and grassroots innovations.

Thus, STI policy instrument in India is there to design and objective aims to be evidence driven, inclusive and bottom-up for the well-being of the nation and its people with socioeconomic and environmental considerations.

National Science Technology and Innovation (STI) Policy and Plan

A comprehensive involvement of different stakeholders carried out mapping the technologies globally with the aim to explore technological possibilities to attain our development goals considering new opportunities in the emerging knowledge economy era. This involves identifying new technology paradigms that might appear in the future and their game changing impact for the country.

National Nanotechnology Policy Framework

Supports the basic and applied research in Nano domain. Through two phases of the mission mode, it had created state of the art research facilities and capacity building in the country. Through its support, India is currently ranked 3rd in number of SCI publications. Nano program has generated a draft guideline and invoked best practices for safe handling of nanomaterials in Research Laboratories and Industries.

National Biotechnology Policy Framework

National Biotechnology Development Strategy (2020-2025): Focuses on 4 major verticals as mentioned below-

- i. Building capacities both human resource and infrastructure to cater to the current needs and also to the future emerging technologies.
- ii. Strengthening and nurturing of a strong basic research innovation driven ecosystem across Research Institutes and Laboratories, both public and private sector, with complete engagement of Startups, Small Industry, Large Industry and also reaching out to tier 2 and tier 3 cities.
- iii. The third major focus is on promoting the translation and product development commercialization ecosystem which necessarily needs to engage public and private sector and also encourage PPP models of co- development. This will require special focus on moving research leads from Laboratory towards technology development.
- iv. The balance between basic and translational research needs to be maintained to ensure that we have a robust pipeline of new knowledge, which helps us to take the translational work forward.

Food and Agriculture

Indian agriculture thrives through innovation, efficiency, and expanded horizons, benefitting both farmers and the entire agribusiness sector alike by minimising losses, enhancing income, and fostering technological advancements.

- The National Food Security Act, 2013 (NFSA 2013) converts into legal entitlements for existing food security programs of the Government of India. It also includes the Midday Meal Scheme, Integrated Child Development Services scheme, and the Public Distribution System.
- The government has taken initiatives to boost the sector under schemes, such as Pradhan Mantri Kisan Sampada Yojana (PMKSY) and Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme (PMFME) to promote cluster development and micro-processing units, encouraging public-private collaborations, and enabling wider market access.
- Major focus for Indian Agri Value Chain is to minimize post-harvest losses, especially for perishable foods that naturally emphasises on enhancing storage and grading facilities, upgrading transportation networks, by leveraging existing schemes like Agriculture Infrastructure Fund (AIF) and Mission on Integrated Development of Horticulture (MIDH).
- Paving the way for Agri-Tech adoption, the government's initiatives, including the Digital Public Agriculture Infrastructure, Digital Agriculture Mission, and National Agriculture Market (e-NAM) Scheme, aim to enhance the adoption of Agri-tech solutions such as AI-based precision agriculture, IoT-based real-time data collection systems, and drone-based agriculture to improve farmer yield and profitability.
- For boosting the agricultural exports, Govt. of India focuses to adopt interventions like demand-driven production through regular market identification, strengthened post-harvest infrastructure with digitally enabled supply chains, adherence to global quality standards, and incentivising the promotion of agricultural exports.

Medicine and Health

The primary aim of the National Health Policy, 2017, is to inform, clarify, strengthen and prioritize the role of the Government in shaping health systems in all its dimensions- investments in health, organization of healthcare services, prevention of diseases and promotion of good health through cross sectoral actions, access to technologies, developing human resources, encouraging medical pluralism, building knowledge base, developing better financial protection strategies, strengthening regulation and health assurance.

India has initiated several reforms that could have far-reaching implications for the health sector and the broader economy. These include:

- Launching Ayushman Bharat, which encompasses the National Health Protection Scheme [Pradhan Mantri Jan Arogya Yojana (PM-JAY)], for coverage of tertiary care

for vulnerable populations and Health and Wellness Centres initiative for the delivery of comprehensive and integrated primary care.

- Setting up the National Health Authority to implement the PM-JAY.
- Initiating the provision of universal sanitation coverage and making the country open defecation-free through the Swachh Bharat Mission.
- Launching Intensified Mission Indradhanush 2.0 to achieve 90 percent vaccination coverage for children under 2.
- Providing clean cooking fuel under the Pradhan Mantri Ujjwala Yojana scheme.
- Providing nutritional and social support for all National Health Protection Scheme beneficiaries with tuberculosis.
- Replacing the Medical Council of India with the National Medical Commission and setting uniform standards for medical education.
- Creating a health technology assessment body (Health Technology Assessment in India) under the Department of Health Research to evaluate all medical technologies.

Bioenergy

Implementation of bioenergy in India

- Renewables make up 22% of total energy supply in India in 2019. The renewable energy share in final energy consumption is 31%. Around 85% of renewable energy is from biomass.
- India is a large country, but also has a high population density, which is mainly concentrated in big cities. Current energy use per capita is very low; however, India is a fast-growing economy, also leading to a strong growth in energy needs.
- The traditional use of biomass for residential heating – which is the dominant type of bioenergy in India - is going down slightly (and mostly replaced by oil and gas). Modern use of biomass for power production is growing.
- Biofuels in transport so far have a very modest role, representing less than 1% of transport fuels.
- The focus is on bioethanol, which represented 3% (by energy) of gasoline consumption in 2019.

- India has important opportunities to further deploy bioenergy, particularly through the replacement of coal by solid biomass in existing assets, the replacement of traditional bioenergy by more modern (and less polluting) forms of bioenergy or the increase of transport biofuels based on domestically available agricultural residues. There are many opportunities for (renewable) energy from MSW as part of the development of waste management systems.

More details can be accessed from the web links as mentioned below:

- DBT-Bioenergy: <https://dbtindia.gov.in/schemes-programmes/research-development/energyenvironment-and-bio-resource-based-applications-1>
- BIRAC: <https://www.birac.nic.in>
- CEIIC: <https://ceiic.socialalpha.org>
- Clean Energy transitions: Accelerating Innovation beyond 2020: <http://mission-innovationindia.net/reports/> - developed under DBT IEA joint collaboration for Mission Innovation
- Mission Innovation India Unit: <http://mission-innovation-india.net>
- <https://www.ppac.gov.in/> for data on fossil fuels production, consumption, Import & Export
- <https://www.mnre.gov.in/> for data on R&D projects.
- <https://www.siamindia.com/> for data on automotive industry.
- <https://mopng.gov.in/en> for data on R&D projects.

Bio-based Industry

- India aims to enable Circular Bioeconomy by advancing ‘High-Performance Bio-manufacturing’ in the country.
- India envisions “Green Growth” in the ensuing ‘AmritKaal’ and this calls for a systematic framework plan for implementation of robust innovative bio-based eco-friendly solutions to further boost the ongoing economic growth.
- India envisages to bring together scientific and technological advancement towards achieving a major goal of the Department’s vision of BioE3 (i.e. Biotechnology for Economy, Environment and Employment) for green, clean and prosperous India.

Hi-tech exports in India:

Experts project low to moderate growth in exports for fiscal 2023-24, given the global economic scenario. India’s overall merchandise exports are likely to experience modest year-on-year growth of 2% to 4% in fiscal year 2024, reaching approximately **US\$ 460 billion**. This projection follows an estimated growth of 5-7% in the current fiscal year. Exports to the US and EU27, which together account for nearly one-third of total merchandise exports, are expected to contract due to an anticipated economic slowdown and inflationary conditions in these regions.

High-technology exports (% of manufactured exports) in India was reported at 12.48 % in 2022, according to the World Bank collection of development indicators.

Country	Year	Value	Change %
India	2022	12	
	2021	10	
	2020	11	

Special economic programmes running now in India

Businesses can consider setting up or doing business with entities in India's Special Economic Zones to take advantage of favorable tax incentives, simplified customs procedures, and a conducive environment for manufacturing and trade. Special economic zones (SEZs) in India are areas that offer incentives to resident businesses. SEZs typically offer competitive infrastructure, duty free exports, tax incentives, and other measures designed to make it easier to conduct business. Accordingly, SEZs in India are a popular investment destination for many multinationals, particularly exporters.

As of 2023, India has 272 operational SEZs with a combined employment of 2.8 million people. These SEZs generated approximately US\$133 billion in exports, with service exports making up around 60 percent of this total. Goods exports from Indian SEZs reached US\$61 billion in FY 2022-23. Kandla SEZ in Gujarat alone accounted for US\$38 billion in export value. Investments into these SEZs grew to INR 656 billion (US\$7.87 billion) as of December 2022, per data from Statista (US\$1=INR83.26).

While India's SEZs are similar to those found in other parts of Asia, business leaders that are considering setting up in a SEZ should seek to understand how SEZs work in India.

The Special Economic Zone Act, 2005 amended India's SEZ policy. Many EPZs have converted to SEZs, with notable zones in Noida (Uttar Pradesh state), Falta (West Bengal state), Visakhapatnam (Andhra Pradesh state), Chennai (Tamil Nadu state), Cochin (Kerala state), Santa Cruz (Maharashtra state), Indore (Madhya Pradesh), as well as Kandla and Surat (Gujarat).

Consequently, the SEZ category encompasses various multiple zone types, such as free trade zones (FTZs), EPZs, industrial estates (IEs), free ports, free trade warehousing zones (FTWZs), and urban enterprise zones, among others. A designated duty-free enclave is considered as a territory outside the customs jurisdiction of India for authorized operations within the Special Economic Zone (SEZ). No import license is necessary, and both manufacturing and service activities are permitted. Units within the SEZ must demonstrate Positive Net Foreign Exchange over a cumulative period of five years from the start of production. Domestic sales are subject to full customs duty and adhere to the current import policy. SEZ units have the liberty to engage in subcontracting. Routine inspections of export/import cargo by customs authorities are not required. SEZ Developers/Co-Developers and Units are entitled to direct and indirect tax benefits as stipulated in the SEZs Act of 2005.

Since the Act's promulgation, the Indian government has also accepted proposals for additional, far smaller SEZs, which must be proposed by developers to the Indian Board of Approval. The SEZ Rules, 2006 lay down the complete procedure to develop a proposed SEZ or establish a unit in an SEZ.

National development policies connected to technology and industry in India

Science, technology, and innovation (STI) have emerged as key drivers of national development around the world. Since independence, four major policies have been implemented: Scientific Policy Resolution (SPR 1958), Technology Policy Statement 1983, Science and Technology Policy 2003 (STP 2003), and Science Technology Innovation Policy 2013 (STIP 2013). As India strives for faster, more sustainable, and inclusive growth, the Indian STI system, which benefits from a large demographic dividend and a large talent pool, will need to play a pivotal role in achieving these national objectives.

Natural raw materials available in India

India's major mineral resources include coal (4th largest reserves in the world), iron ore, manganese ore (7th largest reserve in the world as in 2013), lithium ore (6th largest reserve in the world as in 2023), [6] mica, bauxite (5th largest reserve in the world as in 2013), [7] chromite, natural gas, diamonds, limestone and thorium.

Here are the top 10 latest raw material examples in India:

1. **Coal-** It is a fossil fuel, used in thermal power plants to generate electricity, produce steel, power industrial processes, etc. India is the third-largest producer of coal in the world and, is also home to the fifth-largest proven reserves of coal.
2. **Iron ore-** Another raw material example that is mined in many countries worldwide, including India. Typically, a rock or mineral contains iron. And is the most important source of iron for the steel industry. It is a raw material that is processed and then used to make steel. India is the world's second-largest producer of iron ore.
3. **Steel-** India is the world's third-largest producer of steel. Steel is an alloy of iron and carbon. It is a strong and versatile material that is used in a wide variety of applications, including construction, machinery, transportation, etc.
4. **Copper-** It is a soft, malleable, and ductile metal with very high electrical conductivity. Generally, used in a wide variety of applications, including electrical wiring, plumbing, and construction.
5. **Bauxite-** It is an ore that contains aluminium. Aluminium is a lightweight metal that is used in a wide variety of applications, including construction, transportation, and packaging.

6. **Limestone**- It is a sedimentary rock that is composed of calcium carbonate. And is used in a wide variety of applications, including cement production, steelmaking, and agriculture.
7. **Sand**- It is a loose, granular material that is made up of finely divided rock and mineral particles. Typically, used in a wide variety of applications, including construction, glassmaking, and water filtration.
8. **Cement**- It is a binding agent that is used to hold together aggregates, such as sand and gravel. The most common applications of this raw material, include construction, infrastructure, and manufacturing.
9. **Petroleum**- It is a fossil fuel and is found in underground reservoirs. Typically, a versatile raw material is used in multiple products such as cars, trucks, airplanes, etc. Further, it is also used to make petrochemicals, which are, then used to make plastics, fertilisers, and other products. India is the world's fifth-largest consumer of petroleum.
10. **Natural gas**- It is a clean-burning fossil fuel. And is a good alternative to petroleum and coal. As it can be used to generate electricity, produce fertilisers, and power other industrial processes.

ICT infrastructure and connectivity in India

- 48 PetaFLOPS (PF) high performance computing facility with data centres are created across India under National Supercomputing Mission (NSM). 210 AI-PF infrastructure is also established under NSM, India.
- The Digital India Program, launched in 2015, marked a pivotal moment in India's journey towards digitalisation and included initiatives such as Digi Locker, PM-JDY (Pradhan Mantri Jan Dhan Yojana), PAHAL (Pratyaksh Hanstantrit Labh), and the development of smart cities.
- National Policy on Electronics, launched in 2019, establishes a strategic framework for India's Electronic System Design and Manufacturing (ESDM) sector. The policy actively promotes a comprehensive startup ecosystem, particularly in emerging technology areas, including artificial intelligence, 5G, IoT, machine learning, robotics, optics, and more.
- To support the vision, the Indian government has invested several incentives for electronics manufacturing, semiconductor and display ecosystem, and allied sectors, including advanced chemistry cells, auto components, telecoms and networking, and solar modules.

- The National Broadband Mission was launched in 2019 to roll out 5G services and strengthen the existing 4G network by identifying gaps while promoting “Make in India” through investments on telecom towers, optical fibre infrastructure, and spectrum/R&D to enhance digital communication infrastructure and tap the farthest corners of the country.
- Given the paradigm shift towards digitalisation, the Government of India announced the Data Center Policy in 2020.
- The policy strives to provide trusted hosting infrastructure to meet the country's growing demand for data services while facilitating cutting-edge service delivery to citizens through these reforms: promoting research and development, using indigenous hardware, setting up Data Center Economic Zones (DCEZ), and encouraging renewable energy adoption to power data centres through collaboration with the Ministry of Power on green and sustainable energy initiatives.



MYANMAR

Global Innovation Index – Myanmar

As of World Intellectual Property Organization (WIPO), Myanmar performs better in innovation outputs than innovation inputs in 2022. Myanmar ranks 116th among the 132 economies featured in the GII 2022. The following table shows the rankings of Myanmar over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII ranking. The statistical confidence interval for the ranking of Myanmar in the GII 2022 is between ranks 108 and 118.

Rankings of Myanmar (2020–2022)

Year	GII	Innovation inputs	Innovation outputs
2022	116	122	104
2021	127	128	120
2020	129	129	120

- Myanmar performs better in innovation outputs than innovation inputs in 2022.
- In 2022, Myanmar ranks 122nd in innovation inputs, higher than both 2021 and 2020.
- As for innovation outputs, Myanmar ranks 104th. This position is higher than both 2021 and 2020.

In 2022:

31st Myanmar ranks 31st among the 36 lower-middle-income group economies.

17th Myanmar ranks 17th among the 17 economies in South East Asia, East Asia, and Oceania.

Global Competitiveness Index 2022 ranking – Myanmar

Data not available

Human Development Index 2022 ranking – Myanmar

According to the UNDP's Human Development report 2021/2022, Myanmar's HDI value for 2021 is 0.585 which put the country in the medium human development category. Myanmar ranks 149 in 2021 and 145 in 2020 among the 191 countries. The following table shows the HDI ranking of Myanmar in 2020 and 2021.

Country	Year	Index	Rank
Myanmar	2020	0.6	145
	2021	0.585	149

Source: https://hdr.undp.org/system/files/documents/global-report-document/hdr2021-22pdf_1.pdf

National STI Policies in Myanmar

- Science, Technology and Innovation Law (2018)
- National Science, Technology and Innovation Strategic Plan (2022-2027)
- National Food Safety Policy (2022)
- National Science, Technology and Innovation Roadmap and Strategies (2025-2030) (Drafting)
- Intellectual Property Laws:
 - Trademark Law (2019)
 - Industrial Design Law (2019)
 - Patent Law (2019)
 - Copyright Law (2019)
- Computer Science Development Law (1996)
- Myanmar Digital Economy Roadmap (2020-2025)

Ministry of Science and Technology established the Science, Technology, and Innovation Strategic Plan (STISP) (2022-2027) in December 2022. To achieve the Goals of STISP (2022-2027), the seven departments exerting as the following Pillars, Strategies and Components:

No.	Departments	STISP (2022-2023)		
		Pillars	Strategies	Components
1	Department of Technology, Vocational Education and Training	7	27	76
2	Department of Advanced Science and Technology	8	26	82
3	Department of Research and Innovation	6	14	49
4	Department of Atomic Energy	5	7	29
5	Department of Biotechnology Research	5	6	15
6	Department of Technology Promotion and Coordination	4	5	19
7	Department of Monitoring & Evaluation	4	8	23
	Total	39	93	293

The Ministry of Education has developed the national education strategic plan (NESP) that fully aligns and successfully achieves the reform priorities of the government. The priority activities related to STI by the Ministry of Education are as follows:

- Providing training for nurturing experts continuously in STI.
- Cooperating and communicating with domestic and foreign research department, universities, degree colleges, institutes, industries and other organizations for development of STI and for development of human resources in this field.
- Organizing STI exhibitions, competitions and talks in organization, businesses, departments, universities, degree colleges, vocational training schools which are based on STI.
- Conducting research for production of value -added products by applying chemical technology, nanotechnology and other technologies.
- Conducting basic research and applied research in STI.
- Conducting innovation research to solve technological difficulties and problems faced in domestic industry.
- Conducting necessary developmental research for extension of successful laboratory scale processes to production scale.
- Conducting research and development on occupational safety and health, food and drug.
- Convening annually and participating in domestic and foreign conferences and seminars on science, technology and innovation, exchange of intellectuals and cooperation.

National Science Technology and Innovation (STI) Policy and Plan

Department of Research and Innovation (DRI) under the Ministry of Science and Technology (MOST) has been granted to implement the project on the title of “Development of Science, technology and Innovation Strategies and Roadmap for Myanmar” with the Mekong-Lanchang Cooperation Special Fund 2022. According to the program, three workshops were held in order to develop Myanmar Science, Technology and Innovation Roadmap. Under the guidance of Minister’s office (MOST), Department of Research and Innovation (DRI) continues to work to develop Myanmar Science, Technology and Innovation Roadmap.

National Nanotechnology Policy Framework

Data not available

National Biotechnology Policy Framework

No law or regulation specific for biotechnology/biosafety. Some existing laws are relevant such as the Pesticide Law, Plant Pest Quarantine Law, Seed Law, Animal Health and Development Law, Science and Technology Development Law, National Food Law, Patent Law, etc.

Myanmar became a member country to the United Nations Convention on Biological Diversity (UNCBD) in February 23, 1995 and Myanmar joined the Cartagena Protocol on Biosafety, an extension of the Convention and signed in May 11, 2001.

Ministry of Agriculture, Livestock and Irrigation is implementing to formulate the National Biosafety Framework under Cartagena Protocol and also taking the role of National Focal point of Cartagena Protocol as well. The main objective of the Project on Development of National Biosafety Framework for Myanmar is to develop a national biosafety framework that supports the balance for biotechnology development while guarding the national biodiversity in sustainable way as well as ensuring human health through a series of all stakeholder consultations. The framework is aimed to be relevant with other Myanmar regulatory and administrative systems and consistent with the provisions of the Protocol.

With the help of the United Nations Environment Program (UNEP) and the Global Environment Facility (GEF), Myanmar National Biosafety Framework and Policy was started in 2004 to 2007 but it was drafted not yet approved.

At 2018, with the assistance of United State Department of Agriculture (USDA), National Biosafety Framework and National Biosafety Bill to be compatible with the contemporary situation review and revise. At current, it was developed into final draft in Myanmar. National Biotechnology Policy Framework was incorporated Biosafety Framework which was developed into final draft in Myanmar.

Myanmar supports large expanses of species-rich and globally threatened ecosystems, such as lowland tropical forests and mangroves. As a result of the variety of habitat types, there is an extraordinary amount of biological diversity in the country. Myanmar has begun to recognize the importance of genetic resources to fundamental research and to the pharmaceutical, biotechnological, and agricultural industries. Myanmar Access and Benefit sharing (ABS) Policy Framework is being drafted by Ministry of Natural Resources and Environmental Conservation (MONREC). ABS forms the basis for a policy and a regulatory environment for access and benefits sharing (ABS) of the use of genetic resources under the Nagoya Protocol (NP). The purpose of the ABS policy framework is to warrant that Myanmar's genetic resources are used under a fair, equitable, and sustainable process, that safeguards biodiversity, and works toward realizing their full economic benefit, while ensuring that the citizens of Myanmar, especially

Traditional Knowledge (TK) holders and indigenous/ethnic communities where applicable, receive benefit from the use of these resources.

In accordance with the socioeconomic national policy, based on the objectives and the policy of the Ministry of Science and Technology; the Department of Biotechnology Research has set the following strategic changes in order to achieve the goals of the Strategic Plan for Science, Technology and Innovation (STISP 2022-2027), which is a comprehensive plan covering all aspects of science and technology:

"By Raising the Biosecurity Level, Strengthening the Modern High-Quality Infrastructure, Enhancing the Capability of Researchers, Advancing Biotechnology Research and Expanding Technological Support and Services will lead to Socio- Economic Development."

Since December 2014, Department of Biotechnology Research (DBR) has acted as the National Focal Point for the implementation of the Biological Weapons Convention (BWC), and has been able to send annual reports containing biological information to the Implementation Support Unit (ISU). DBR has participated in the European Union- Chemical, Biological, Radiological and Nuclear Risk Mitigation Centers of Excellence (EU-CBRN) projects for biosafety. In addition, as a cooperation with ASEAN member states, DBR is acting as a Focal Point in the Sub-Committee on Biotechnology.

Food and Agriculture

The Progress of Agriculture and Food Security sector under BIMSTEC

1. Myanmar, especially Ministry of Agriculture, Livestock and Irrigation, is taking as a lead country for Agriculture and Food Security Sector in BIMSTEC. The sector began its work with the formation of the BIMSTEC Expert Group on Agricultural Cooperation. So far, the Ninth Meeting of the BIMSTEC Expert Group on Agricultural Cooperation was held on 8th September 2022, virtually hosted by Myanmar, since its first meeting was held in March 2007 in Nay Pyi Taw.
2. The first BIMSTEC Agriculture Ministerial Meeting was hosted by Myanmar in 2019 and also Myanmar hosted the Ninth Meeting of the BIMSTEC Expert Group on Agricultural Cooperation (the 9th EGMAC) in virtual manner on 8th September 2022. The meeting was attended by Focal Points of Expert Group on Agriculture Cooperation from all BIMSTEC member states. The meeting reviewed the progress on decisions taken at the Eighth Meeting of the Expert Group on Agricultural Cooperation, the progress made in implementation of the seven identified common projects, and also discussed to finalize the Plan of Action (PoA) on Strengthening BIMSTEC Agricultural Cooperation (2023-2027) and the Memorandum of Understanding between International Food Policy Research Institute and BIMSTEC, and other discussion includes the Fisheries and Livestock Sub-sector under the

purview of the BIMSTEC Senior Officials on Agriculture (SOM-A) and BIMSTEC Ministerial Meeting on Agriculture (BAMM).

3. As informed by respective Member States during the 9th EGMAC, i) Thailand hosted "BIMSTEC Workshop on Encouraging Private Sector Participation especially in Value-Chain Management for Agricultural Products: Cold Chain Management for Agricultural Products on 16-17 June 2022 virtually, ii) Sri Lanka hosted virtually for the BIMSTEC Workshop on Encouraging Private Sector Participation especially in Value-Chain Management for Agricultural Products: Developing Value Chain through Post Harvest Management on 15 to 16 August 2022, and Bhutan hosted the Workshop on the Role of the Public-Private Partnership in Developing Value Chains through Post-Harvest Management virtually on 13 to 14 October 2022.
4. The 2nd BIMSTEC Senior Official Meeting on Agriculture was hosted by the Government of India back to back with the 2nd BIMSTEC Ministerial Meeting on Agriculture held on 9th and 10th November 2022, respectively. At Ministerial Meeting on Agriculture, the Ministers adopted the Plan of Action on Strengthening BIMSTEC Agricultural Cooperation (2023-2027) that comprises five areas of cooperation such as i) Increasing agricultural productivity, ii) Promoting sustainable agricultural practices, iii) Enhancing Agricultural Trade and Investment, iv) Promoting agriculture research and development, and v) Improving food security and nutrition. In addition, the meeting agreed to include the Fisheries and Livestock Sub-sector under the purview of the BIMSTEC Senior Officials on Agriculture (SOM- A) and BIMSTEC Ministerial Meeting on Agriculture (BAMM), approved to sign the Memorandum of Understanding between International Food Policy Research Institute (IFPRI) and BIMSTEC and adopted the Joint Statement of the Second BIMSTEC Ministerial Meeting on Agriculture. The MOU between IFPRI and BIMSTEC has been signed on 5th March 2023.
5. Based on the decision of 2nd BIMSTEC Senior officials' Meeting on Agriculture and 2nd BIMSTEC Ministerial Meeting on Agriculture held on 9th and 10th November, 2022, respectively, Myanmar hosted "the Regional Seminar on Food Security and Sustainable Food Systems in BIMSTEC" on 25th January 2023, virtually. The Seminar delivered messages including policy for food security and sustainable food systems in BIMSTEC, the role of agri inputs for increasing productivity and food systems, the current status and way forward to improve food security and transformation of the food system in respective BIMSTEC member states, building resilience food systems to vulnerabilities, shocks, and stress in the region, transforming food systems for food and nutrition security in the BIMSTEC region, and climate resilience agriculture and food security in the region. With the approval of the BIMSTEC Leaders during the Fifth BIMSTEC Summit, the Agriculture and Food Security sector comprises two sub-sectors, namely Agriculture Sub-sector, and Fisheries and Livestock Sub-sector. Myanmar as a host the First BIMSTEC Expert

Group on Fisheries and Livestock Sector will be taken place in July 2023, as virtual mode. However, Thailand inconvenience to attend the above-mentioned meeting due to its prior engagement, the meeting will be held in 2023.t in the Sub-Committee on Biotechnology.

National Food Safety Policy

The Ministry of Health is focused on strengthening the national food safety control system within the Republic of the Union of Myanmar. As an initial step, the Ministry of Health has developed ‘National Food Safety Policy’, launched at 27th April, 2022, which adopts the ‘farm to fork’ food chain approach and which provides strategic direction and sets down the union government’s overall vision for the protection consumers’ health and for facilitating food trade. This policy is aligned with the principles set out in the wider ASEAN Food Safety Policy and the ASEAN Principles and Guidelines for National Food Control Systems. The principles of this policy aim to facilitate the development of a sustainable and robust food safety regulatory framework within the Republic of the Union of Myanmar and to demonstrate its commitment to its responsibilities as an active ASEAN member state. This National Food Safety Policy promotes a harmonized, integrated, risk-based approach to food safety regulation throughout the food chain, from farm to fork. This National

Food Safety Policy will be reviewed periodically and updated as required to reflect new developments which impact the safety of foods or its regulation within the Republic of the Union of Myanmar.

As food control division under the Ministry of Health, Myanmar, verification process of import/export and domestic processed food recommendation are done via <https://foodesubmission.fda.gov.mm> online e-submission system. Ministry of Health, Myanmar cooperate with ASEAN countries according to mutual recognition agreements. National food law was announced at 3rd march, 1997 and amended at 2013 and 2023. Labeling order for prepackaged food was announced at 20th January, 2022. Now, Ministry of Health, Myanmar is implementing nutritional labeling according to national standard.

Mandalay Technological University, which was instructed to produce agricultural engineering graduates, has been planning and implementing programs to meet load and national needs from 2021.

As instruction of State Administrative Council (SAC) in the opening ceremony of Nay Pyi Taw Technological University held on November 12, 2022 for the expansion of the agricultural engineering degree program at the Nay Pyi Taw Technological University because the engineering skills required for agriculture will greatly support the development of agricultural production. Therefore, it was planned opening of agricultural engineering degree course in Nay Pyi Taw Technological University to be included in the 2023 university directory to be opened in the 2023- 2024 academic year.

The ability to produce, import and distribute world-class quality, health friendly food items in Myanmar. In the 2019-2020 academic year, Yangon Technological University has opened a food engineering degree course in order to meet the needs of food technology for the advancement and dissemination of modern technologies related to food and nutrition.

About 70 percent of Myanmar's population depends on agriculture for a livelihood, and the country's economy is based on agriculture. Therefore, the nation must possess the technologies used to manufacture agricultural products into products such as food. Technology and human resource development programs in the field of food technology, including food production technology, food preservation technology, food quality maintenance technology, and research and development of food products, require assistance. Therefore, we would like to obtain short-term and long-term food technology training programs, technology exchange programs, and technical support for the development of a curriculum in food technology that is suitable for Myanmar.

In order to share knowledge with MSMEs that manufacture, distribute and sell food, Basic Food Safety Training was held for 2 days from July 4, 2023 to July 5, 2023 at Technological University (Nay Pyi Taw). Before opening the course, small Association of Small and Medium Enterprises; we connected with Nay Pyi Taw, and most of the entrepreneurs from the MSMEs Association attended and taught. The training includes basic food safety, Food safety that producers should know, Food packaging safety that distributors should know, Practical teaching of food safety and security knowledge that food service providers should know, and practical teaching of food laboratory testing, group activities and presentation of food safety plans. The second Basic Food Safety Training was held from August 15, 2023 to August 17, 2023 for 3 days in cooperation with Nay Pyi Taw University of Technology and Nay Pyi Taw Myanmar Organic Growers Association. Association of Small, Small and Medium Business Entrepreneurs In collaboration with Nay Pyi Taw, it is expected to open and teach food safety training and other food technology education courses according to the township.

Regarding the sector of Food and Agriculture, the Ministry of Education (MoE) has offered new BSc Program in Food and Science at the University of Yangon and the University of Mandalay since 2022-2023 academic year. MoE has cooperated with the Ministry of Science and Technology in ASEAN Science, Technology and Innovation Committee as national focal persons of Sub-committee on Food Science and Technology (SCFST) and Sub-committee on Marine Science and Technology (SCMST). During the year 2021 to 2023, the University of Yangon has signed ten new MoU/MoAs and renewed three MoU/MoAs for continuous building of its international profile. The Ministry has also asked higher education sector to expand graduate research in Bachelor Degree programs recently in order to incubate the innovative and creative thinking needed for an economically competitive society. The MoE has encouraged universities to work with MSMEs for consulting, sharing knowledge by holding seminars, and developing new human resource programs for skilled labors.

Research areas in agriculture and food undertaken by Department of Biotechnology Research (DBR), Ministry of Science and Technology (MOST) are as follow:

Agriculture

- Development of climate smart resilience crops
- Assessment of agricultural soil nutrients.
- Improvement of important agronomic trait crop by gene transfer (Pest resistance crop by agrobacterium mediated gene transfer)
- Pest / fruit fly control
- Indoor hydroponic farming technology
- Hairy root production of transgenic plant under *in vitro* and mass production in bioreactor
- Micro propagation of medicinal plants, fruits and flowers via plant tissue culture technique
- Marker Based Genetic Variation Analysis of Myanmar Rice Varieties for Eating Quality, Salt Tolerance and Drought Tolerance
- Assessment of Soil microbial diversity using molecular technique.
- Isolation, characterization and application of beneficial microorganism for bio fertilizer production
- Screening of drought tolerance plant growth promoting bacteria to improve soil fertility
- Development of bio fungicide

Food

- Development of probiotics from fermented food
- Development of formulated fish feed

Agriculture is central to Myanmar's rural economy. Ayeyarwady Region is considered the country's rice bowl. Rice stands as the primary crop in the Ayeyarwady Region. Alongside rice, the region also cultivates maize, sesame, groundnut, sunflower, beans, pulses, and jute. However, the majority of the towns in the region use traditional farming. One major drawback of traditional farming was its high demand for labor-intensive work and costs, heavily reliant on manual labor and susceptible to weather conditions like rain. Hence, this region as well as other region where modern farming has to be initiated such as Nay Pyi Taw needs the development of modern farming practices that utilize machinery farming, acre plots, production roads, modern irrigation and drainage, etc.

The Department of Technical and Vocational Education and Training, Ministry of Science and Technology, has the vision to continuously train and develop technical and vocational human resources in line with local needs to support the socio- economic development of the country". Hence, two of the policies of the Department include: (a) To produce human resources for the development of modern economy, and to develop technical and vocational education and training and (b) To create teaching and learning opportunities and offer technical, vocational education and training courses that meet the needs of the region. To successfully implement such policies, the Department is implementing the strategies related to TVET sector under Science, Technology

and Innovation Strategic Plan (STISP) (2022-20227). According to Pillar-1, Strategy-2, component-1 of STISP of STISP “Expanding the formal training courses offered by Technical and Vocational Institutes and providing career guidance counselling”, three Government Technical Institutes under DTVET are offering farm machinery technology diploma courses for local youths to promote advanced agricultural practices using agricultural machinery, produce skill labours for advanced machinery farming and increase the productivity and quality of crops on farms. These three Government Technical Institutes are Government Technical Institute (Wakema), Government Technical Institute (Kyaiklat) and Government Technical Institute (Nay Pyi Taw).

Medicine and Health

Ministry of Health (MoH), Myanmar is the main ministry for health care in Myanmar. The objectives of the ministry are as follow:

1. To enable every citizen to attain full life expectancy and enjoy longevity of life.
2. To ensure that every citizen is free from diseases.

To realize these objectives, all health activities are implemented in conformity with the following Strategies:

1. Widespread disseminations of health information and education to reach the rural areas.
2. Enhancing disease prevention activities.
3. Providing effective treatment of prevailing diseases.

Developing thirty-year long-term plan (Myanmar Health Vision 2030), MoH has been implementing to fulfill its vision with the 3 Policies (Table-1) and 14 Strategic Plans (Table-2). There are 26 Laws (Table-3) enacted by MOH to ensure that every citizen is free from diseases.

Table 1: List of Policies managed by MoH, Myanmar

Sr	Title
1	Community based Health Worker Policy (2020)
2	National Health Policy
3	National Population Policy (Draft)

Table 2: The strategic plans managed by the MoH, Myanmar

Sr	Title
1	National Strategic Plan for the elimination of Lymphatic Filariasis in Myanmar (2017-2020)
2	National Leprosy Control Strategy (2019-2023)
3	National Strategic Plan for Prevention and Control of NCDs (2017-2021)
4	Five Year Strategic Plan for Young People Health (2016-2020)
5	Myanmar National Comprehensive School Health Strategic Plan (2017-2022)
6	Myanmar National Strategic Plan on Viral Hepatitis (2016-2020)
7	National Strategic Plan for Prevention and control of Avian Influenza and Human Influenza Pandemic Preparedness and Response (2006)
8	National Strategic Plan for Preparedness and Response to Zika Virus Infection (2016)

9	Strategic Action Plan for Strengthening Health Information 2017-2021
10	National Strategic Plan on HIV and AIDS Myanmar 2016-2020
11	Five Year Strategic Plan for Reproductive Health 2014-2018
12	National Strategy for Rural Water Supply, Sanitation and Hygiene (WASH) 2016-2030 (Final Draft)
13	National Strategic Plan for Tuberculosis 2016-2020
14	National Strategic Plan for Dengue Prevention and Control 2016-2020

Table 3: List of Laws enacted by MoH Myanmar

Sr	Title
1.	The Lunacy Act (India Act IV,1912) (English Version)
2.	The Myanmar Medical Degree Act (India Act VII, 1916) (English Version)
3.	The Poison Act (India Act XII,1919, Vol.IV) (English Version)
4.	The Geneva Convention Implementing Act (India Act XIV,1936) (English Version)
5.	Public Health Law
6.	Maternal and Child Welfare Association Law
7.	National Drug Law
8.	Prevention and Control of Communicable Diseases Law (1995)
9.	Eye Donation Law
10.	Traditional Drug Law
11.	National Food Law
12.	Traditional Medicine Council Law
13.	Blood and Blood Product Law
14.	The Control of Smoking and Consumption of Tobacco Product Law
15.	The Control of Smoking and Consumption of Tobacco Product Law (English Version)
16.	The Law Relating to Private Health Care Services
17.	Dental Law
18.	Accident and Injury Prevention Law
19.	Myanmar Medical Council Law
20.	Myanmar Medical Council Law (3-4-2020)
21.	Law Relating to the Nurse and Midwife

22.	Population Control Law
23.	Myanmar Redcross Law
24.	Body Organs Donation Law
25.	Prevention and Control of Communicable Diseases Law (1995) (English Version)
26.	Amendment of Prevention and Control of Communicable Diseases Law (2011)

Source: <https://www.mohs.gov.mm/main/content/publication/Strategic%20Plans/list/1/12>

Department of Biotechnology Research (DBR), Ministry of Science and Technology (MOST) has been undertaking the following activities:

- Development of pharmaceutical and cosmeceutical production using natural resources such as medicinal plants and endophytic microbes and evaluation of their biological activities
- Determination of the activities of Myanmar medicinal plants by cell and pharmaceutical related research

Bioenergy

Ministry of Energy, Myanmar is leading for the sustainable energy developments which are the mature energy statistics and finding the way to fulfill the domestic energy demand with the coordination and cooperation with related energy departments, regional and international organization. In this process, energy concerned sector has been implementing the renewable energy development such as bioenergy or biofuel as the alternative energy fuel to support the domestic fuel requirements. At the present, Ministry of Energy, Myanmar is planning to find out the policy regarding that the implementing of production and testing for the ethanol mix biofuel and biofuel production for the future fuel consumption. Myanmar energy sector requires the technical and financial assistance by the regional and international cooperation.

Bio-based Industry

During the visit of the former Prime Minister of India, Dr. Manmohan Singh to Myanmar, the establishment of the Rice Bio Park -RBP (Paddy and Rural Prosperity) was agreed and signed Memorandum of Understanding (MOU) between the two Governments of Myanmar and India in 2012 at the Department of Agricultural Research in Nay Pyi Taw, Myanmar. RBP aimed for the biological conservation of entire biomass of the rice plant to increase income by producing market driven value-added products that lead to helping smallholder rice farmers to get more on job opportunities aside from conventional rice production. RBP intends to

1. Strengthen agricultural sector and improve food security as well as income generation of small farm families.

2. Encourage producing value-added and market-driven rice and rice related products.
3. Set up a Rice Bio-Park demonstrating the various techniques in rice biomass utilization in the integrated demonstration farm.

In RBP, all steps of the rice supply chain from growing, harvesting, packing, processing, transporting, marketing, consuming and disposing waste and supportive measures are designed with a view to promoting sustainable development. The unique activities of the RBP are producing high nutritive value food to reduce mal- nutrition, feed for the livestock and poultry, and the transmission of Good Agricultural Practices to the farmers for enhancing rice productivity. From 2017-2018 to 2019-2020, the seventeen rounds of training about circular approaches to total 510 of rice farmers from almost all states and regions in Myanmar. Researchers in RBP carried out more researches about producing *Azolla* for rice-fish farming, bio-fertilizers from rice husk, and several treatments on using various kinds of earthworms for vermiculture, etc. These all activities can be applied for the integration of mixed crop-livestock and organic farming, agroforestry and water recycling and wastewater reuse. RBP in Myanmar put circular approaches of rice production as demonstration project as rice is dominant in total cultivated area and production.

Regarding the Bio-based Industry, Directorate of Industrial Supervision and Inspection under the Ministry of Industry is in cooperation with the Ministry of Science and Technology and Ministry of Agriculture, Livestock and Irrigation in order to get the least environmental impact from the waste products produced from the rice husk fuel gasifier Industries/ factories and to get long-term industrial benefits from them. As the forestry sector in Myanmar, the operation of value-added products from timber and non-timber forest products is being carried out in order to contribute to the country's socio-economic development. In the sector of wood-based industry, a total of 160 saw-mills (large), 394 band-saws, 966 saw-mills and 343 T&G are running currently. The exporting of raw log has been banned since 1st April 2014, whereas only semi-finished and finished products are allowed to be exported.

Hi-Tech Export in Myanmar

High-technology exports (current US\$) in Myanmar was reported at 296,935,620 USD in 2021, according to the World Bank collection of development indicators, compiled from officially recognized sources. Myanmar - High-technology exports - actual values, historical data, forecasts and projections were sourced from the World Bank on November of 2023.

Source:[https://tradingeconomics.com/myanmar/high-technology-exports-us-dollar-wbdata.html#:~:text=High%2Dtechnology%20exports%20\(current%20US,compiled%20from%20officially%20recognized%20sources](https://tradingeconomics.com/myanmar/high-technology-exports-us-dollar-wbdata.html#:~:text=High%2Dtechnology%20exports%20(current%20US,compiled%20from%20officially%20recognized%20sources)

Special economic programs running now in Myanmar

Special economic zones running now in Myanmar are as follows-

- a) Thilawa Special Economic Zone in Yangon Region,
- b) Kyauk Phyu Special Economic Zone in Rakhine State, western Myanmar, and
- c) Dawei Special Economic Zone in Tanintharyi Region in the Southeast of Myanmar

Thilawa Special Economic Zone

It is located 23 km southeast of Yangon city center along the Yangon River. The 250 sq km project developed by Myanmar-Japan consortium (comprising of Mitsubishi, Maurbeni, Sumitomo, Japan International Cooperation Agency (JICA)) and Myanmar public and private sector companies.

Kyauk Phyu Special Economic Zone

The area of Kyauk Phyu Special Economic Zone is 1,600 hectares (4,000 acres) and it is situated in Kyauk Phyu District in Rakhine State. It is a key area for both the national economic development and Rakhine State development.

In 2015, a consortium led by CITIC won the tender to develop the deep-sea port and industrial estate projects. The framework agreement aims to implement the Kyauk Phyu Deep Sea Port project, according to international practice.

Dawei Deep Sea Port and SEZ

It is located at the southern part of the country touching the Andaman Sea and 350 km away from Bangkok. Dawei SEZ has an area of 196 square kilometers.

As Legal Frameworks for SEZs, the following laws and rules were enacted;

- a) Myanmar Special Economic Zone Law & Dawei Special Economic Zone Law (27th January, 2011)
- b) Myanmar Special Economic Zone Law (23rd January, 2014)
- c) Myanmar Special Economic Zone Rule (27th August, 2015)

However, the **Myanmar Special Economic Zone Law** (The State Peace and Development Council Law No. 8/2011) and the Dawei Special Economic Zone Law (The State Peace and Development Council Law No. 17 /2011) were repealed by Myanmar Special Economic Zone Law of 2014.

The objectives of the Myanmar Special Economic Zone Law (2014) are to create jobs, promote living standards, provide vocational training opportunities, promote the export of goods, and attract domestic and foreign investments (Chapter II).

The law offers **SEZs tax holidays**, exemptions from customs duties and other taxes, and protection from nationalization for investors and developers. Under the SEZ law, the price of goods manufactured, services rendered, and good exported shall not be restricted.

The **SEZ law** includes incentive such as corporate income tax relief, import duty relief, long-term land leasing and expropriation protection mechanisms and low labour costs and etc.

Tax Incentives for SEZ Development are as follows:

Table 4: Tax Incentives for SEZ Development

Income tax exemption	Import tax exemption
Free Zone (For Export)	Free Zone
7 years' exemption 50% relief for next 5 years 50% for next 5 year if profit reinvested within 1 year	Exemption on import of raw materials, machinery & spare parts, construction material and motor vehicles for construction purpose Exemption on import of trading
Promotion Zone (For Local Market)	Promotion Zone
5 years' exemption 50% relief for next 5 years 50% for next 5 years if profit reinvested within 1 year	Duty exemption on import of machinery & spare parts, construction material and motor vehicles for construction purpose. 50% relief for next 5 years

Commercial tax/VAT exemption	One Stop Service Centre (OSSC)
Investor may be given exemption investor may be given exemptions during specific period only	- Ossc has set up for approval of investment, company registration, entry visa, stay permit, certificate of origin, collection of taxes, approval of employment permit, permission for factory construction and other documents. - All ossc sections use their own standard operating procedures
Dividend pay-out	Asset protection
Investor may apply for income tax exemption for dividends based on profit accrued locally for which tax has been paid	- Assets profits & other rights shall be recognized and protected - It is guaranteed that investment shall not be nationalized

If the investors and developers invest in Special Economic Zone, they can enjoy exemption and relief for income tax and commercial tax in accordance with 2014 Myanmar Special Economic Zone Law.

If the investors and developers invest outside the Special Economic Zone, they can apply the relevant tax laws as follow:

- In Myanmar, domestic taxes are collected by the Internal Revenue Department (IRD) under the Ministry of Planning and Finance. IRD is collecting five kinds of taxes and duties including income tax, commercial tax, specific goods tax, stamp duty and state lottery. The tax rates are enacted annually by Union Taxation Law.
- 65 kinds of stamp duties are described in Schedule 1 under the Myanmar Stamp Act.
- The parties have to pay stamp duties in line with the Myanmar Stamp Act.
- The tax rates under the 2023 Union Taxation Law are as follows:
 - If the companies make investments in Myanmar, they shall be charged 22% of corporate income tax and 5% of commercial tax in accord with the existing tax laws.
 - Income tax rate for individual person is progressive rate from 0% to 25%.
 - Associations of persons engaged in the exploration or exploitation of oil and natural gas sector in Myanmar shall be subject to 25% income tax on the total net income without deducting the allowances under Section 6 of Income Tax Law.
 - Other than the exempted goods and services mentioned in the Union Taxation Law 2023, the commercial tax shall be charged at 5% on the sale proceeds if the goods are produced and sold within the country, or on the landed value if the goods are imported, or on the sale proceeds for carrying out importing goods and reselling them in the country, and trading, or on the charges for servicing.
 - 8% of commercial tax shall be charged on the export of electrical energy and 5% on the crude oil. On the sale proceeds of export all commodities other than electricity and crude oil, the commercial tax shall be charged at 0%.
 - In case, when the specific goods are being imported into Myanmar or manufactured in Myanmar, Specific goods tax shall be imposed in consistent with the defined rates under Section 11 of Union Taxation Law, 2023.
 - Specific goods tax shall not be charged on the export of specific goods other than logs and different types of timber. (Log and different types of timber – SGT 10%)

National development policies connected to technology and industry in Myanmar

The current vision of the Ministry of Agriculture, Livestock and Irrigation (MOALI) is an inclusive, competitive, sustainable agricultural system in which food and nutrition are secured, that contributes to the socio-economic well-being of farmers and rural people and to the further development of the national economy.

The MOALI set up the seven policies that aim for the development of the agriculture sector in Myanmar;

- a) Land Use and Management Policy
- b) Water Use and Management Policy
- c) Agricultural Mechanization and Input Sector Policy
- d) Research, Development and Extension Policy
- e) Marketing, Value-added Processing and Export Policy
- f) Governance, Institutional and Human Resource Development Policy
- g) Environmental Conservation and Climate Change Resilience

In addition, Good Agricultural Practices (GAP), Good Animal Husbandry Practices (GAHP) and Good Aquaculture Practices (GAqP) protocols and guidelines in order to achieve food safety in Myanmar and to meet in the standard of international and global market. The MOALI conducted innovative and academic research activities for agricultural development in line with Myanmar Sustainable Development Plan and Policy. Moreover, the Ministry has carried out breeding research for regionally adaptable varieties, climate resilience seed production and new technology. The Farmer Channel began transmission on October 15, 2013 as free- to-air channel. Production of agricultural related edutainment programs aim to improve farmer knowledge and their livelihood. Farmer Channel is a joint program between Myanmar Radio and Television (MRTV) and MOALI to broadcast 6 hours looping in every day. MRTV helps as a network provider and MOALI servers as a content provider. The Department of Livestock and Aquaculture Research (DLAR) was established under the MOALI with vision of an inclusive, competitive, food and completes the socio-economic well-being of farmers and rural people as well as fostering national economic growth through an understanding and application of innovative livestock and aquaculture research. The Ministry opened a call center on March 1, 2017 with the aim of providing agricultural information and advices to farmers and people and facilitating the technical decision by addressing promptly of daily challenges and assisting agricultural technology along the agricultural value chain.

The seven policies that aim for the development of the agriculture sector in Myanmar.

- Small and Medium Enterprise Development Policy (2015)
- National Energy Efficiency and Conservation (EE&C) policy, strategy and roadmap (2016)

- Industrial Policy (2016)
- Myanmar Industrial Development Strategy (2017)
- Automatic Policy (2019)
- Green Economy Policy Framework (2021- 2030)
- National Textile Policy (2022)
- Electric vehicles and related industries development policy (2023)
- Green Economy Policy Framework is being formulated

Industrial Development Policies formulated by Ministry of Industry

Industrial Policy (2016)

The Ministry of Industry formulated the Industrial Policy and it was enacted by approval of The President Office in February, 2016 with the vision; **to establish a new modern industrial nation** for the development of industrial sector.

According to the Industrial Policy the following industries which will be carried out in priority under policy are;

- a) Labour Intensive Industries (Short-Term)
- b) Primary Commodity Industries (Short-Term)
- c) Basic Manufacturing Industries without advanced technology (Short-Term)
- d) Medium Technical-based Industries: (Medium-Term)
- e) Advanced Technical-based Industries: (Long –Term)
- f) Infrastructure Industries: (Long –Term)

Myanmar Industrial Development Strategy (2017)

The Ministry of Industry promulgated an Industrial Policy in 2016 and followed-up the Myanmar Industrial Development Strategy 2017 with the assistance of UNIDO. In the Myanmar Industrial Development Strategy, the Strategies has been designed for the implementation of the Short-Term Priority Industries as below;

- a) Textile & Garment Industry
- b) Food Processing & Packaging Industry
- c) Plastic Processing Industry
- d) Construction Materials Industry
- e) Labor Intensive CMP Industry
- f) Machine, Tools & Parts Industry
- g) Chemical Industry
- h) Tire & Rubber Industry
- i) Pulp, Paper & Paper Products Industry

Among them, the following three main priority industries were selected in connection with the policies of the State;

- a) Textile & Garment Industry
- b) Food Processing & Packaging Industry
- c) Machinery Industry

Small and Medium Enterprise Development Policy (2015)

The Ministry of Industry formulated the Small and Medium Enterprise Development Policy and it was enacted in 2015. The vision of this policy is as follow;

“Creation of regionally innovative and competitive SMEs across all sectors that enhance income generation and contribute to the social-economic development Mission.”

Regarding to this policy, "to enable the emergence of more SMEs and the transformation from cottage industry to SMEs and from SMEs to large scale industries" is one of the objectives. Moreover, priority businesses are selected as the short-term and long-term plan to successfully achieve the aim of the policy.

National Energy Efficiency & Conservation Policy, Strategy and Roadmap for Myanmar (2016)

In Myanmar, the National Energy Efficiency and Conservation (EE&C) policy, strategy and roadmap has been formulated in 2016. The scope of the National EE&C policy covers four sectors: industry, commercial & public building, residential buildings and other (street lightings and uses). The main target is to reduce energy consumption reduction 20% by 2030 based on year 2012 energy consumption data. The main aim is to fulfill the national targets of energy intensity reduction and reduce carbon emissions in Myanmar. The results can support the national energy security as well.

Automotive Policy (2019)

The Ministry of Industry formulated the Automatic Policy and it was enacted in March, 2019 with the vision; to increase the usage of vehicles with affordable prices in each and every sector and to be higher Unit in Operation-UIO. According to the policy, in the road map of the development of vehicle industries mainly includes (a) Vehicle Sales (b) Vehicle Production and (c) Parts Production.

National Textile Policy (2022)

The Ministry of Industry formulated the National Textile Policy and it was enacted in June, 2022 with the vision; to become the competitive and sustainable textile Industry of the Union which contributes to continuous economic growth, to the further development of decent work and well-being of communities, to safeguard the cultural heritage and to protect environmental resources.

EV Policy (2023)

In Myanmar, the electric vehicles and related industries development policy was published in February 2023. The vision of this policy is to reach the usage of electric vehicles to 14% in 2025; 32% in 2030; 67% in 2040 and 100% by 2050 of the total number of registered vehicles per year". This policy will implement 18 basic principles in three periods: short term (from 2022 to 2025); medium term (from 2026 to 2030) and long term (from 2031 to 2050).

Regarding the policy, in the short term, import and sale as the CBU will be encouraged and also assembly and production as the SKD / CKD. In the medium term, SKD will be prioritized, and CKD will be prioritized in the long term.

Laws and bylaws formulated by Ministry of Industry

The Ministry of Industry has drafted and enforced the laws and bylaws regarding the industrial sector are as follows;

- a) The Private Industrial Enterprise Law – 1990
- b) Prevention of Hazard from Chemical and Related Substances Law – 2013
- c) Boiler Law – 2015
- d) Small and Medium Enterprises Development Law - 2015
- e) Small and Medium Enterprises Development by law – 2016
- f) Prevention of Hazard from Chemical and Related Substances Rules -2016
- g) Industrial Zone Law (2020)

Furthermore, the Ministry of Industry has been formulating the following law and by law;

- a) Industrial Zone by Law
- b) Energy Efficiency and Conservation Law

Green Economy Policy Framework (Draft)

Ministry of Natural Resources and Environmental Conservation, Myanmar is formulating Green Economy Policy Framework. The green economy policy framework (2021- 2030) is a guiding document to enable decision-makers at union, state and regional level to identify investments that should be promoted to support a Green Economy in Myanmar and delivers multiple benefits

to people, environment and the economy and to pursue Government of Myanmar's commitment to the achievement of Sustainable Development Goals. The vision is to enhance the investments in a low-carbon, green economy development trajectory that prioritizes the efficient use of natural resources. The major guiding principles are sustainability, efficiency, inclusivity and resiliency. Green economy approach would stimulate new and more environmental-friendly sectors with circular business models, mitigate the negative impacts of production and consumption, and provide the country with sustainable financing, resulting in more resilient and socially inclusive growth. Green technology is especially important in mitigating the human's adverse activity on the environment and in promoting sustainable development.

Intended Nationally Determined Contribution (INDC)

To ensure Myanmar continues to develop and maintain conditions to secure the wellbeing and safety of its people, Myanmar has adopted a strategic vision to transform Myanmar into a climate-resilient, low-carbon society that is sustainable, prosperous and inclusive, for the wellbeing of present and future generations. Myanmar submitted its INDC in August 2015 and endorsed the Paris Agreement in 2017. Based on the INDC, work has progressed in the forestry, electricity, and rural renewable energy sectors. Adaptation was identified as a priority and work has progressed across a range of sectors. In the coming years, the means of implementation, through international financial support, technology transfer, and capacity building, will allow Myanmar to scale-up enhanced adaptation and mitigation actions.

Natural Raw Materials Available in Myanmar

Natural Raw Material Available for the Ministry of Industry's products

Table 5: Natural Raw Material Available for the Ministry of Industry's products

No.	Material	Industry	Remark
1	Lime Stone	Steel, Steel Billet Production	
2	Sand	Steel, Steel Billet Production	
3	Rubber Smoked Sheet	Tyre and Rubber Production	
4	Fiber GA	Refractory cement board Production	
5	R6D Salvage Fiber R6D	Refractory cement board Production	
6	(MSR -10/20) Myanmar Standard Rubber (MSR -10/20)	Tyre Production	
7	Calcium Carbonate	Tyre Production	
8	Ball Clay	High voltage Insulator/Ceramic Production	
9	China Clay	High voltage Insulator/Ceramic Production	
10	Limestone	Glass / Cement Production	
11	Laterite	Cement Production	
12	Gypsum	Cement Production	

13	Marble Block	Marble Production	
14	Feldspar	Glass / High voltage Insulator Production	
15	Quartz	Ceramic Production	
16	Dolomite	Glass Production	
17	River Stone	Table wares and sanitary ware	
18	Cement	Refractory cement board Production	
19	coal	Cement Production	
20	Clay	Cement Production	
21	Quartz	High Voltage Insulator Production	
22	Silica Sand	Glass Production	
23	Sand	Glass Production	
24	Magnesium Chloride (Feldspar)	Glass Production	
25	Cullet	Glass Production	
26	Local Seed Cotton	Textile and Textile Production	
27	Local Cotton	Textile and Textile Production	
28	Avocado Oil	Pharmaceutical production	
29	Castor Oil	Pharmaceutical production	
30	Sugar	Pharmaceutical production	
31	Maltose	Pharmaceutical production	
32	95% Alcohol	Pharmaceutical production	

Forest Sector

Myanmar has diverse ecosystems and biodiversity, and belongs to a rich entity of natural resources. The priority of the country's natural resource management is to emphasize on ensuring sustainable utilization and management.

In Myanmar, in line with the Sustainable Forest Management, the country's forests have been managed following the Annual Allowable Cut (AAC) under the Myanmar Selection System (MSS) in order to ensure the sustainability and perpetual utilization of forest resources.

The allowable productivity for timber production is 13,689 stocks per year for teak wood with 6'6" gird limit, and 605,651 stocks per year for hard wood with 6'-7' gird limit. The productive capacity is anticipated based on the annual increment, and the production is allowed only within its capacity.

The following list shows the production of natural forest products in 2020, 2021 and 2022 in Myanmar:

Sr.	Type of Forest Product	Unit	Number of productions		
			2020	2021	2022
1	Teak	Cubic ton	7483	4342	3022
2	Hardwood	Cubic ton	26121	14930	11202
3	Teak & Hardwood Post	Pcs	57882	20609	49791
4	Teak & Hardwood Pole	Pcs	11790	14880	15526
5	Firewood	Cubic ton	228523	161422	194219
6	Charcoal	Cubic ton	140316	102827	112334
7	Bamboo	1000 Pcs	127042	93410	141006
8	Rattan	1000 Pcs	3881	4371	6071
9	Cutch	Viss	149246	144520	203900
10	Barks	Viss	649333	405860	470685
11	Jute	Viss	19492	20045	23463
12	Bastard sandal wood	Viss	2500	1500	2200
13	Indwe-Pwenyet	Viss	150743	110520	125016
14	Thanatkha	Viss	31764	18245	22249
15	Cardamon	Viss	12353	7868	10560
16	Kanyin Resin	Viss	250	825	740
17	Turpentine	Viss	3538	2065	0
18	Dani-Thetkye	1000 Pcs	31695	22077	28969
19	Honey	Viss	15762	11336	14357
20	Bees-Wax	Viss	935	431	688
21	Bat's Guano	Viss	176570	157090	176910
22	Lacquer	Viss	18536	15818	14047
23	Serpent wood	Viss	19400	8501	8372
24	Edible Bird's Nest	Viss	1341	1165	1227
25	Lac	Viss	46922	38935	44742
26	Thin Baung Thar	1000 Pcs	28	12	20

Mining Sector

Myanmar is endowed with extensive varieties of mineral resources of metallic and non-metallic, industrial raw materials, precious stones and fuel minerals. According to the Geological Survey and exploration activities, more than 60 minerals commodities and more than 2000 mineral occurrences were recorded.

Myanmar has four major richness on the status mineral resources. They are Metallic Mineral, Industrial Mineral, Stone and Gemstone. There are very rich on Jade, Ruby, Sapphire,

Limestone; rich on Copper, Lead, Zinc, Tin, Tungsten, Iron, Gold, Coal, Baryte; fairly rich on Antimony, Silver, Nickel, Gypsum and poor on Chromite, Manganese, PGM (Platinum Group of Mineral) Minerals, Radioactive Minerals, Diamond, Fertilizer Minerals, Fluorite, Bauxite, Mercury, Kaolin, Feldspar, Uranium, Quartz, Bentonite, Mica, Rare Earth Elements-REE. Based on the previous data and some mineral have high potential for systematic exploration. There are eight mineral belts according to geological setting and mineralization.

ICT infrastructure and Connectivity in Myanmar

At present, with the increased internet connectivity, rising smart phone penetration and new electronic functioning have been growing rapidly in Myanmar. The development of e-Government is becoming more and more visible in the post pandemic era.

Since the focal ministry of Myanmar, the Ministry of Transport and Communications is endeavoring to enhance ICT infrastructure and e-Government initiatives, to facilitate online transactions and to create trust and confidence in the use of digital services.

In 2016, the Government of Myanmar adopted "Myanmar e-Governance Master Plan". In 2018, the e-Government Steering Committee was formed in order to provide the guidance for the implementation of e-Government projects and initiatives. e-Government Working Committee and its sub-Committee are performing their relevant tasks under the leadership of Steering Committee. Currently, "Myanmar e-Governance Master Plan 2030" has been drafted with the vision of effective and efficient implementation of digital government in order to achieve genuine, inclusive and transformative economic development of Myanmar.

Aim to develop digital first delivery of government's services and to enhance data transaction between government agencies, business communities and the public, the e-Government Data centers were established by the Ministry of Transport and Communications. These data centers provide e-Government common application, server co-location service, government cloud service and center operation support facilities.

In addition, the e Government Integrated Data Center (eGIDC) Establishment Project has been undergoing, which will become the first national-level data center in Myanmar. Only pilot project can be implemented in Naypyitaw, Yangon and Mandalay. To pursue smart cities, teledensity is 112.6% and internet penetration is 102.67%.

Universities under the Ministry of Science and Technology are doing researches in Big Data analysis, Internet of Things, Artificial Intelligence, ICT-based Smart Infrastructure, Software Defined Networking and other current technology trends. Syllabus and curriculum are also being updated in accordance with the changing technologies. Universities are also working together with the Regional Governments to develop e-government system including ICT infrastructure, applications and other online services. Universities are also giving advice for the development of smart and safe cities around the country. Universities are also developing ICT-based teaching

learning and management platform such as Learning Management System (LMS) and University Information Management System (UMIS). Some of the universities are also doing collaboration and cooperation with other institutions and universities not only in the ASEAN and Asia-Pacific Region but also around the world.

In the Server Room (Core Router, Manage Switch, Firewall, and Blade Server) and the network system connected to the basic network devices, the teaching matters of the university are being carried out, and the internet network system of the university campus has been made available. In teaching matters, based on the Learning Management System (LMS), online assessments are being used to regularly check the learning progress of students. The e- government system is used to deal with office management issues and teaching/ management communication issues. The meeting hall is also built and used as a Smart Meeting Room based on IOT Devices, and there is also a Smart Class Room. In addition, projectors are installed in every classroom and teaching is conducted based on the LMS system. Establishing Private Cloud Data and Using it in University Campus Area Using the learning Management System (Moodie System) in Teaching /Learning activities: Being able to establish a Library Management System to Support teaching/Learning Activities and Research Projects Implementation and Using E-Library System to Support teaching/Learning Activities.

A Digital Conference on Science, Technology and Innovation (STI) hosted by ASEAN was held and rector of University of Computer Studies (Yangon) joined and the following information was discussed:

1. To get more internet access
2. Importance of database (especially in science-based)
3. To develop al technology
4. With provision of science and technology and also science diplomacy to increase in measure of covid-19.
5. Deployment of new technology in prevention of COVID-19
6. Remote sensing technology in robotic technology
7. Cashless transition tool deployed
8. Increase in using remote technology during COVID-19 periods.
9. Need to look for secure anti science for STI, policy, need to include the development of S&T
10. Need to research for covid-19 in post periods.
11. There may deficiency in STI budget in countries.
12. In digital conference, their includes importance of STI, and upgrading science-diplomacy to attack against COVID-19

Conclusion

The Ministry of Science and Technology was established for sustainable development of the science and technology sector and the development of qualified human resources which are important for the national socioeconomic development on 2nd October in 1996, From 2016 to 2021, it merged with the Ministry of Education and in 2021, On June 17th, it was prepared and organized by the Order No. (138/2021) of the State Management Council. Myanmar's economy is based on agriculture.

Myanmar uses traditional farming and needs the development of modern farming practices. Currently, Myanmar is taking as a lead country for Agriculture and Food Security Sector in BIMSTEC.



NEPAL

Global Innovation Index – Nepal

Nepal ranks 111th among the 132 economies featured in the GII 2022. The following table shows the rankings of Nepal over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Nepal in the GII 2022 is between ranks 106 and 111.

Rankings of Sri Lanka 2020 – 2022

Year	GII	Innovation inputs	Innovation outputs
2022	111	106	111
2021	111	99	116
2020	95	89	106

- Nepal performs better in innovation inputs than innovation outputs in 2022.
- This year Nepal ranks 106th in innovation inputs, lower than both 2021 and 2020.
- As for innovation outputs, Nepal ranks 111th. This position is higher than last year but lower than 2020.

In 2022:

26th Nepal ranks 26th among the 36 lower-middle-income group economies.

10th Nepal ranks 10th among the 10 economies in Central and Southern Asia

Global competitiveness index 2022 rankings – No data available for Nepal

Human Development Index 2022 ranking - Nepal

Nepal's HDI value for 2022 is 0.602 which put the country in the medium human development category positioning it at 143 out of 189 countries and territories. From the lens of gender, Nepal stands at 113th position in global Gender Inequality Index. Between 1990 and 202, Nepal's HDI value increased from 0.399 to 0.602, an increase of 50.9 percent.

Country	Year	Index	Rank
Nepal	2022	0.602	143

National STI Policies in Nepal

Ministry of Education, Science and Technology is the ministry who looks upon the overall STI landscape of Nepal. The major policies on STI are mentioned below:

National Science Technology and Innovation (STI) Policy 2019

The objectives aim to boost national production and productivity by leveraging science, technology, and innovation, while also fostering knowledge-based entrepreneurship, sustainable resource management, and the development of skilled scientists and technical experts through modernization and research-oriented education. The Policy has identified the priority sectors for utilization of STI, which are: I) Growth of the industrial production and productivity, II) Commercialization of agriculture and utilization of land; III) Sustainable infrastructure development (housing, water supply, tourism and green energy); IV) Sustainable utilization of biological and precious mineral resources; V) Environment, climate change and disaster risk reduction; and VI) Good governance and delivery of service, cyber and national security.

National Biotechnology Policy 2006

The objectives of the National Biotechnology Policy, 2006 of Nepal are to address food security challenges by enhancing food grain and nutritious food production, particularly for the growing population, while prioritizing areas where biotechnology can benefit Nepal. Additionally, the policy aims to promote research and development in biotechnology to improve forestry, agriculture, and food sectors in a globally competitive and environmentally sustainable manner, foster managerial skills, attract competent researchers, encourage entrepreneurship, mitigate environmental degradation, and facilitate the translation of research outcomes into practical applications for rural and national economic development.

Food and Agriculture

There are specific and generalist policies in Food and Agriculture. A few of those policies are mentioned below:

- National Agriculture Policy
- Agro business policy
- Rangeland policy
- Livestock Policy 2068
- National Seed Vision 2013 – 2025
- Agriculture Mechanization Promotion Policy 2071
- National Coffee Policy 2064
- National Fertilizer Policy, 2058
- National Agro-forestry Policy
- National Food-safety Policy 2076
- National Animal Health Policy, 2078

Medicine and Health

There are specific and generalist policies in Medicine and Health. A few of those policies are mentioned below:

- Oral Health Policy 2070
- Nutrition Policy and Strategy
- National Drug Policy
- National Drug Transfusion Policy
- National Safe Abortion Policy
- National Mental Health Policy
- National Medicine Policy
- National Health Policy

Biomass Energy Strategy 2017

There is Biomass Energy Strategy 2017, The objectives of Nepal's biomass energy policy include: generating energy from agricultural and forest residues as well as organic wastes to enhance energy supply and security; promoting entrepreneurship in biomass energy to bolster employment and income generation; and reducing reliance on imported energy by efficiently producing and utilizing biomass resources.

Hi-tech exports -Nepal

High-technology exports (current US\$) in Nepal was reported at 3330281 USD in 2022, according to the World Bank open data sources.

High-technology exports (% of manufactured exports) in Nepal was reported at 1% in 2022, according to the World Bank collection of development indicators.

Country	Year	Value	Change %
Nepal	2022	330281	- 93 %
	2021	6433383	- 48%
	2020	9513473	

Special economic programmes running now in Nepal

As per 15th periodic plan, Government of Nepal has announced program of One Province One Special Economic Zone (SEZ), under which there are 7 SEZ locations identified, Bhairahawa, Simara, Panchkhal, Biratnagar, Jumla, Dhagadi and Gorkha. Two sites are already in operation as per SEZ Act 2014.

The investors in SEZ are granted permission and administered in all respect of export and import under strictly simplified ~One Window Policy~ or one stop service. They have liberal tax regime with exemption to varying degrees in income tax, excise duty, VAT and others taxes and duties.

They have facilities of repatriation of investment, immigration, banking, export-import facility, foreign worker's employment etc. All relevant services such as custom, banking, insurance, police, fire, medical etc. are at the door. SEZs are governed by liberal production oriented labor law with hire and fire policy forbidding union and strikes. Instead, the labors have wages much higher than outside SEZs, fixed working period and liberal extra benefits and allowances.

National development policies connected to technology and industry in Nepal

- Industrial Policy 2067
- National Intellectual Property Policy 2073
- Electricity Development Policy 2058
- Telecommunication Policy 2060
- Information and Communications Technology Policy, 2072
- Green Hydrogen Policy, 2080

Natural raw materials available in Nepal

The major raw materials related to minerals used in industrial and construction works in Nepal are: Limestone (most abundant), Coal, Talc, Clay red, Granite and marble (identified, but not extensively explored), Semi-precious and precious stones (tourmaline, aquamarine, ruby and sapphire), The Department of Mines and Geology is engaged in the exploration and evaluation of mineral resources in Nepal. Other main natural resources include mainly the water resources for hydropower.

ICT infrastructure and Connectivity in Nepal

Ministry of Communication and Information Technology have the authority for spectrum management, regulating broadcasters (radio and Television), telecom operators, Press and media and films. It has departments like Department and Information and Broadcasting, Department of Information Technology, Nepal Telecommunication Authority, Department of Information Technology to facilitate the ministry in this regard. Government of Nepal have launched Digital Nepal Framework 2019 with eight important sectors and 80 digital initiatives.

Some ICT data are presented below:

1. 73.15 % of HH have ordinary mobile phones followed by 72.94 % of HH with smart mobile phones, Television penetration 49.37% and internet facility penetration of 37.72% (National Census 2021)
2. ICT industries contribution to GDP 3.71%
3. ISP Licensed: 131, No. of ISP in operation 63 (major 10), Basic Telephone service provider: 1, GSM Cellular mobile service provider: 2



SRI LANKA

Global Innovation Index – Sri Lanka

Sri Lanka ranks 85th among the 132 economies featured in the GII 2022. The Global Innovation Index (GII) is a ranking of world economies based on innovation capabilities. Consisting of roughly 80 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation.

The following table shows the rankings of Sri Lanka over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Sri Lanka in the GII 2022 is between ranks 80 and 87.

Rankings of Sri Lanka 2020 – 2022

Year	GII	Innovation inputs	Innovation outputs
2022	85	102	68
2021	95	103	85
2020	101	107	83

- Sri Lanka performed better in innovation outputs than innovation inputs in 2022.
- This year, Sri Lanka ranks 102nd in innovation inputs, higher than both 2021 and 2020.
- As for innovation outputs, Sri Lanka ranks 68th. This position is higher than both 2021 and 2020.

In 2022:

11th Sri Lanka ranks 11th among the 36 lower-middle-income countries.

5th Sri Lanka ranks 5th among the 10 economies in Central and Southern Asia.

Global competitiveness index 2019* rankings – Sri Lanka

**[The most recent data for such an index is available for 2019, and as of the time of posting, there is no Global Competitiveness index estimate for Sri Lanka in 2022].*

Covering 141 economies, the Global Competitiveness Index 4.0 measures national competitiveness, defined as the set of institutions, policies, and factors that determine the level of productivity.

			Diff. from 2018²	
Rank	Economy	Score¹	Rank	Score
84	Sri Lanka	57.1	+1	+1.1

Human Development Index 2021* rankings – Sri Lanka

**[The most recent data for such an index is available for 2021, and as of the time of posting, there is no HDI estimate for Sri Lanka in 2022].*

Sri Lanka's HDI value for 2021 is 0.782, which puts the country in the high human development category, positioning it at 73 out of 191 countries and territories. Between 1990 and 2021, Sri Lanka's HDI value increased from 0.629 to 0.782, an increase of 24.3 percent.

Sri Lanka's HDI values for 2019 and 2020 are the same as in 2021. Between 1990 and 2019, Sri Lanka's life expectancy at birth increased by 7.5 years, mean years of schooling increased by 2.3 years, and expected years of schooling increased by 2.8 years. Sri Lanka's GNI per capita increased by about 229.4 percent between 1990 and 2019.

Country	Year	Index	Rank
Sri Lanka	2021	0.782	73

National STI Policies in Sri Lanka

- National Science and Technology Policy: The first policy statement in 1978; a comprehensive National Policy in 2008.
- Assigned a Science and Technology Ministry (the first Minister of Science appointed in 1989).
- National Science and Technology Commission (NASTEC) in 1999.
- Policy documents and the new thinking has occurred in response to the rapid advances and changes in global science and technology, as well as the social, political, and economic developments in Sri Lanka in 2008.
- A National Science, Technology, and Innovation strategy was developed in 2010 for the period 2011–2015 to direct the developments in the sector in line with the government's economic development plan.
- A national ten-by-ten matrix to prioritize research and development activities in Sri Lanka (NRDF 2016–2020) was launched in 2014 as the outcome of the 7th Biennial Conference on Science and Technology (BICOST VIII).
- An implementation strategy for the NRDF 2016–2020 was developed in the 8th BICOST in 2016.
- A set of policy recommendations were proposed to the government as technical outputs of the 9th BICOST held in 2023 (four technical reports: Climate Change, Agriculture, and

Food Security; Nutraceuticals and Lead Medicinal Compounds from Sri Lankan Indigenous Bio resources; Value Addition to Natural Resources and minerals of Sri Lanka; Renewable Energy, Energy Storage, and Green Hydrogen.

Policy Elements

1. Foster a National science and innovation culture that effectively reaches every citizen of the country.
2. Build-up, sustain, and progressively increase the resource base of scientists and technologists necessary to respond to the developmental needs of the Country.
3. Recognize the key role of science and technology as an important and essential item in National development.
4. Foster scientific and technological activities in priority areas and encourage the development of self-reliance in scientific and technological capabilities.
5. Develop, select, acquire, and adapt scientific knowledge and technology necessary for the progressive modernization of all sectors so as to enhance the country's competitiveness in the world economy.
6. Ensure quality standards for S&T institutions, S&T products, and services to face the challenges of competitive global markets and the needs of domestic market.
7. Ensure sustainable development while conserving the natural resources of the country and protecting the environment through the appropriate use of science and Technology.
8. Encourage and strengthen cooperation in science and technology between Sri Lanka and other countries, with a view to building capacity in technologies that will have a positive impact on the economic development of the Country.
9. Encourage research in fundamental and applied aspects of science and technology and development related to areas such as nanotechnology, biotechnology, material science, energy, information and communication technology, and Electronics.
10. Encourage the utilization of local resources and the further development of indigenous knowledge and technologies.
11. Encourage the use of science and technology to mitigate and manage the harmful effects of natural hazards and other phenomena, such as global warming.
12. Develop capabilities in science and technology to strengthen national security.
13. Encourage and reward science- and technology-based innovations and inventions, and ensure the protection of intellectual property rights (IPR).

Source: Policy Paper, National Academy of Sciences of Sri Lanka.

Science, Technology and Innovation Action Plan for Agriculture Sector Fruits and Vegetable Crops in Sri Lanka 2021-2025

The National Science and Technology Commission (NASTEC), with collaborative policy consultation with the Science and Technology Policy Institute of South Korea (STEPI) and local consultants, developed STI policy instruments in the agriculture sector, with a particular

emphasis on improving productivity, process, and entrepreneurship development. The draft plan was submitted to the Ministry of Agriculture to consider implementation.

Sri Lanka's 9th Biennial Conference on Science and Technology (BICOST IX)—2023 Technical Outputs

The 9th BICOST was convened by the National Science and Technology Commission of Sri Lanka (NASTEC) on March 23rd and 24th, 2023, under the patronage of the Hon. Minister of Education. The objective of the forum is to provide a platform to discuss science, technology, and innovation (STI) that would pave the way to making available the STI policy recommendations to the government as per the S&T Development Act 1994/11. The theme of the 2023 Conference was ‘Science, Technology, and Innovation for Sustainable Development in the Era of Climate Change’.

Over the course of a series of three-month pre-conference activities, followed by a two-day main conference, more than 250 scientists from academia, industry, the bureaucracy, and representatives of public and private sector institutions worked on the following sub-technical thematic areas and came up with a set of policy recommendations through a series of technical reports:

1. Climate change, agriculture, and food security
2. Nutraceuticals and lead medicinal compounds derived from Sri Lankan bioresources
3. Value addition to natural resources and minerals
4. Renewable energy, energy storage, and green hydrogen

Strategies Proposed for the Advanced Technology Initiative

- Establish National Centers of Excellence.
- Foster synergistic alliances and networks.
- Implement the National Nanotechnology Initiative.
- Develop mechanisms to transform Sri Lanka into a high-tech knowledge hub for technologies used in mega projects.
- Ensure the adoption of only sustainable, advanced technologies.
- Prioritize the exchange of personnel in high-tech areas through the Overseas Special Training Programme (OSTP) and International Partnerships for Science and Technology (IPSAT).
- Create schemes to assist local entrepreneurs in forging technical collaborations with foreign high-tech industries to transfer advanced technologies.

Presenting “Innovating Sri Lanka”, the three year action plan on Science, Technology and Innovation in Sri Lanka, the Minister of Education introduced the emerging technologies that Sri Lanka is currently working on and has succeeded such as Nanotechnology, Biotechnology, Genomics, Immunotherapy, Enzyme Manufacturing, Biopharma, Robotics, Mechatronics, Artificial Intelligence and Space Technology.

Hi-tech exports in Sri Lanka

In 2022, high-technology exports for Sri Lanka were 103 million US dollars. Though Sri Lanka high-technology exports fluctuated substantially in recent years, it tended to increase through 2011 - 2022 period ending at 103 million US dollars in 2022.

Country	Year	Value	Change %
Sri Lanka	2022	103,354,129	9.57%
	2021	94,325,867	13.44%
	2020	83,149,830	-8.62%

Sri Lanka should leapfrog from Industry 2.0 to Industry 4.0

Sri Lanka, with its 1% of high-tech products in manufactured exports, is still in 2IR. Anyone visiting a tea factory or a garment factory will observe that the whole manufacturing process is operated manually by using electricity-powered machines. But they are the largest export earners for the country. But this should not be taken as a disappointment. That is because it gives Sri Lanka a 99% chance to move up the ladder to be a high-tech manufacturing nation. All it has to do is adopt a suitable policy package consistently to take the country down that rugged path.

But there is a challenge to be met. That challenge is, since Sri Lanka is presently in 2IR, how should it leapfrog straight to 4IR, bypassing 3IR? This is difficult, but not impossible. In today's advanced learning, adoption, and adaptation techniques, a Nation need not move ahead by following the steps one after the other. It can fast track by jumping several steps at a time. Therefore, for Sri Lanka to reach 4IR within the next decade or so, it is not an impossibility.

Sri Lanka's plan to become a high-tech hub should not be a mere wish

The Government's commitment to convert Sri Lanka into a high-tech hub was pronounced in Budget 2021. Similar announcements were made by the previous Government also in its economic policy statements. However, without a concrete plan to attain that goal, they just remained a wish that had not gone beyond paper. The present Government can avoid making the same mistake by going for a time-bound action plan and sticking to it consistently. This needs several steps to be followed.

Need for preparing a road map

Step 1 will be the preparation of a road map to convert Sri Lanka to a high-tech economy. The road map should clearly spell out the objectives, strategies, inputs to be used, key milestones, and final deliverable products. Vietnam, which at present has a high-tech component in its manufactured exports, prepared a road map in 2019 to complete the country's transmission to 4IR by 2030.

Vietnam had embarked on its journey to be a 4IR country a few years ago by introducing science, technology, and creative innovation to its production structure. The new road map will have

several milestones to pass in that journey. One such milestone is to improve its ranking in the Global Innovation Index, or GII, to be within the top 40 countries by 2030. This is an eye-opener for Sri Lanka since it is ranked 101 out of 131 countries in GII. Another milestone aspired to by Vietnam is to increase the size of the digital economy to 30% of GDP while increasing labour productivity by 7.5% per year. It also plans to make broadband access inclusive by 2030. For that, it plans to complete the digitization of the whole society, businesses, and government.

Join global production sharing network

Step 2 involves joining the global supply chain or global production sharing chain by producing inputs for products that are assembled elsewhere. In today's context, a country cannot produce a whole product and claim that it is made in that country. That is because components come from manufacturing facilities in many countries. It has been found that Apple sources components for the iPhone from 43 countries, while it is finally assembled in the Foxconn Factory in China. There are several manufacturing facilities in Sri Lanka that have already joined the global production sharing chain. Two noted firms are Harness Lanka at Biyagama, which supplies sensors for airbags in vehicles, and MAS Fabric at Thulhiriya, which produces canvas for Nike shoes. But the country needs a critical pool of such firms—a sufficiently large number of firms that can change the shape of the country—to join 4IR. Vietnam, in its road map for 4IR, has specifically proclaimed its intention to seamlessly integrate into the global economy. If this is to be attained, Sri Lanka should switch from the present domestic economy-based economic growth to international economy-based economic growth strategies.

Acquisition of technology

Step 3 involves strategies for acquiring technology immediately for use by the country's manufacturing outfits. One way to do this is to use technologies already developed elsewhere around the globe. They could be automatically acquired by attracting foreign direct investments, or FDIs, with a high-tech component. This was the strategy adopted by South Korea and Singapore in their initial phases of economic development and the strategy presently being pursued by Vietnam. In the early 1980s, Sri Lanka got such technology for its apparel industry through FDIs. Today, garments are no more fashionable, and, hence, the technology drive should be for high-tech products.

The need for R&D and marketing

Step 4 requires Sri Lanka to develop its own technology in the medium and long run. This requires Sri Lanka to invest a greater portion of its national income in research and development, or R&D. According to World Bank data, Sri Lanka spends only 0.1% of its GDP on R&D. This is much lower even by South Asian standards, where on average, 0.65 of GDP is spent on R&D. This expenditure need not necessarily be incurred by the government. As it has happened in Japan, South Korea, Singapore, and Hong Kong, private companies too should participate in R&D drives. Once new inventions are made through R&D, such inventions should be properly

marketed to enable prospective entrepreneurs to produce them commercially. Austrian-American economist Joseph Schumpeter named this process innovation.

Convert STEM to STEAM

Step 5 is about developing the country's thinking, inventing, and innovative power through a proper system of education. Traditionally, it has been emphasised that education should cover science, technology, engineering, and mathematics, abbreviated as STEM. But to create a creative thing, it is essential that inventors possess a creative mind too. This comes from creative art. When creative art is added to STEM, it will become STEAM. The policy of the government should be to change education, learning, training, and systems to reflect STEAM.

Special economic programs running now in Sri Lanka

- Local Empowerment through Economic Development and Reconciliation (LEED+) Project
- Healthy Socio-Economic Recovery of the Micro and Small Enterprise Sector of Sri Lanka COVID-19)
- Chinese energy project on three islands off the Jaffna peninsula
- East Container Terminal in Colombo Port
- Port City, Colombo
 - The project “will have a significant impact on the national economy,” as it may generate 210,355 jobs, and add 0.7 billion U.S. dollars to the FDI, 11.8 billion dollars to gross domestic product, and 0.8 billion dollars to government revenue every year.
 - Special economic zone

National development policies connected to technology and industry

- Trade Policy
- Industrial policies
- National Policy Framework
- Priority for National Security
- Friendly, non-aligned, Foreign policy
- An Administration free from corruption
- New Constitution that fulfils the people's wishes
- Productive Citizenry and a vibrant Human resource
- People-Centered Economic Development
- Technology-Based Society
- Development of Physical Resources
- Sustainable Environmental Management
- Disciplined, law-abiding, and values-based society
- National Policy for Construction

- National Science and Technology Policy in Sri Lanka
- National Biotechnology Policy
- National Research and Development Framework
- National Physical Planning Policy and Plan Sri Lanka 2010–2030
- Water policy development in Sri Lanka
- Sri Lanka's private investment policies (2013)
- The National Policy on Health Information
- National Health Policy
- National Environment policy
- Water Development
- National Climate Change Policy
- National Energy Policy and Strategies of Sri Lanka
- National Mineral Policy
- National Indigenous Medical Policy (under Cabinet observation)

Natural raw materials available in Sri Lanka

- Natural Rubber, Tea, Coconut
- Minerals - graphite, mineral sands, limestone, phosphates, and gems Phosphate, Sand, Clay
- Cosmetic Raw Material - Aloe vera, Sandalwood, *Gyrinops walla*, Agar wood
- Cotton
- Spices – Cinnamon, cloves, Cumin Seed, Pepper

ICT infrastructure and connectivity in Sri Lanka

Expand ICT infrastructure and improve the population's digital literacy.

Following years of steady growth, the ICT sector is embracing a period of fast-paced innovation. While the telecoms and business process outsourcing (BPO) industries in Sri Lanka are reaching maturity, efforts are being focused on developing more innovative and high-end products. The sector's organic growth is benefiting other industries, such as agriculture, manufacturing, and tourism, and supporting the emergence of technology-focused small and medium-sized enterprises (SMEs) and start-ups, which in turn are creating jobs and value in the economy. At the same time, government and private sector stakeholders are trying to promote the country as a technology hub for international firms and investors. However, despite the progress made, recent political uncertainty and ongoing regional disparities in ICT infrastructure need to be addressed to ensure the sector's momentum does not stall.

Digital ID

Another key initiative outlined in Vision 2025 is the creation of a citizen's digital ID. Developed in conjunction with telecoms providers, the scheme aims to make online transactions easier and

envisioned a wide range of applications for the digital ID, including use as an electronic signature for documents and for the submission and receipt of payments. According to officials, the storage of biometric data online will enhance security and improve efficiency in terms of managing and monitoring government data.

The project, which was included in the 2016 budget but subsequently stalled for two years, was set to resume in January 2019 with a pilot phase, but as of February 2019, there have been no updates on its progress. The pilot will involve the issuance of digital ID cards to social welfare beneficiaries, which represent around 20% of the population. If this goes well, cards could be issued to all residents the following year. However, conflicts remain regarding ownership of the project, which makes its future uncertain. Funding has been allocated to the MTDI, while ownership of the card lies within the Department for Registration of Persons. Local media reports have indicated that there are lingering tensions between the two government entities.

Major digital policies have also emerged with support from the private sector. Most notably, the Island of Ingenuity (IoI) brand was launched in 2018 by SLASSCOM in partnership with a number of government bodies, including the EDB. IoI aims to generate \$5 billion in ICT export revenue by 2022, create 1000 start-ups, and generate 200,000 jobs.

E-Government

Digitalizing government services and processes has been one of the main priorities of the coalition government since it was formed in 2015. Speaking before the onset of the constitutional crisis in late 2018, Prime Minister Ranil Wickremesinghe indicated that introducing a new digital law would be essential for integrating technology within state institutions. In May 2018, the MTDI signed a memorandum of understanding with Microsoft Sri Lanka concerning the implementation of measures that would help facilitate digitalization nationwide. These include technical assistance to formulate and develop an e-government strategy; a software procurement programme for the public sector; a cybersecurity risk assessment; and skills development for students through the establishment of “smart classrooms”

In some areas of government, such as trade and investment, technology is already being used to speed up efficiency. In 2018, for example, the BoI successfully inaugurated a web portal connecting six-line agencies under a single one-stop shop platform with the aim of fast-tracking investment processes for foreign companies. The BoI is planning to extend its portal to 18 more agencies that are responsible for the necessary approvals for international firms to establish themselves in Sri Lanka. The BoI has received assistance for the project from the World Bank and Australia’s Department of Foreign Affairs and Trade.

Human Resources

The ICTA has designed a roadmap identifying policy priorities and their timeline for implementation as regards digitalizing the economy. According to chairman of the ICTA, short- and medium-term efforts should focus on addressing key human resource constraints. First, to meet a shortfall in recruitment to certain specialized roles, The Chairman of the ICTA informed

OBG that it is necessary to streamline the issuance of short-term work permits for foreign workers with specialized skills. This is particularly important for home-grown companies that do not benefit from BOI assistance in processing these permits.

Another priority for the ICTA is to achieve a better geographical balance in terms of IT development by unlocking the growth potential of areas outside of Colombo and its surroundings. For instance, Jaffna in the north has well-developed education facilities as well as the capacity to supply large numbers of skilled ICT and knowledge industry workers. However, because only a few ICT companies are located there, most graduates seek work opportunities in Colombo or overseas instead of locally, which hampers development.

A third priority for the ICTA involves addressing the low percentage of women in the job market and increasing the participation of disabled individuals in the workforce. According to the Chairman of the ICTA, policies need to be implemented to incentivize women to enter and remain in employment, as well as to foster an environment that enables employees to work from home.

Internet Penetration

The success of policies regarding digitalization hinges on ensuring the population has access to the internet. In 2018, this was estimated to be 6.7 million people, or around 32% of the total population. According to the TRCSL, as of September 2018, there were approximately 147.9 mobile subscriptions per 100 inhabitants. Out of a total of 32 million mobile subscriptions, some 5.7 million were mobile broadband connections and 1.5 million were fixed broadband connections. Between January and June of that year, around 67.5% of internet connections were made through a mobile phone, 27.1% from a laptop or desktop computer, and 3% and 2.4% from a tablet or mobile phone, respectively, according to a report on computer literacy published by the Department of Census and Statistics.

4G & 5G Licenses

In order to improve internet access for their users, mobile operators are laying the groundwork for the eventual rollout of 5G technology. At the Techno Sri Lanka 2018 exhibition, which took place in October of that year, Mobitel demonstrated 5G technology using massive multiple-input multiple-output (MIMO) in 64x64 MIMO configuration and in the 3.5 GHz band. This follows earlier trials by telecoms firms operating in the country, including Dialogue Axiata, which carried out a trial in August 2017. The eventual deployment of 5G technology in the mass market is expected to facilitate positive changes in many sectors, including education, health, agriculture, and manufacturing, as well as the start-up industry. According to local press reports, Dialogue has signed an agreement with the MTDI and Swedish multinational telecoms company Ericsson to establish an innovation centre to utilise the download speeds and latency of 5G to develop internet of things (IoT) and ICT technologies, solutions, and prototypes.

In another significant move, Dialog and Ericsson are preparing to deploy a large-scale IoT network across Sri Lanka, facilitating the development and implementation of various smart city initiatives. The Managing Director of Ericsson Sri Lanka and Maldives informed OBG that the necessary infrastructure and ICT towers for the network are already in place, and the company is ready to commercially launch 5G. However, the firm is currently awaiting resolution of the government's delay in spectrum allocation. The Managing Director expressed cautious optimism that the rollout could begin in 2020. Additionally, Ericsson is transforming street lights in Colombo into radio towers, which will help expand the frequency and make 5G available throughout the city.

VoIP Bans

Voice over internet protocol (VoIP)—the technology that delivers voice communications and multimedia over the internet—is currently not permitted in Sri Lanka, and VoIP services are blocked by all operators. However, the TRCSL has established a list of categories of users, customers, and clients that are allowed to claim exemption. These include public switched telephone network operators and their affiliates, authorised call centres and BPO operators, customers that deliver international logistics, international banking, IT and software development and support services, and licenced internet service providers.

Tech Start-ups

The ecosystem for technology start-ups has significantly evolved over the past decade, benefiting from both government and private sector support. The General Manager and Vice President of the local software firm Sysco Labs informed OBG that seed funding is now widely available through grants, competitions, including hackathons, accelerator programs, and angel investors. In response to high real estate prices, the authorities have supported initiatives by private actors to provide office infrastructure for new businesses. In 2017, the EDB spearheaded a budget proposal to provide funding to entrepreneurs, forming a committee that subsequently approved concessionary loans for more than 26 start-ups through government-owned banks.

Despite these moves, there are still a number of issues that must be addressed if Sri Lanka is to further develop an ecosystem conducive to new business growth. One common challenge is the ability of new firms to scale up. While finding seed capital is relatively easy, a lack of venture capital makes it difficult for entrepreneurs to progress through the rounds of funding and scale their activities locally and regionally. Furthermore, borrowing costs from banks are still high, which may limit sustainable growth. Inadequate sources of funding to grow new businesses also impact angel investors, since they may not have the means to exit their investment. At the same time, more needs to be done to convince investors that their money is safe in Sri Lanka and that they can withdraw their funds at any time. The tech industry is pressing the government and the financial sector to undertake reforms and follow the example of countries such as Singapore, where venture capital and private equity funds set up regional offices.

Outlook

ICT stakeholders are largely optimistic about the future of the sector, even against a backdrop of political uncertainty. The main reason for this is that, historically, the industry has flourished regardless of the degree of public sector support. For example, the same reforms that were so conducive to growth in the BPO industry, including the provision of seed funding and the removal of monopolies, were not extended to the software industry, yet it succeeded in expanding both in size and productivity. The private sphere within the ICT sector in particular, which has its own export and investment strategies, should remain resilient to headwinds.

In the long term, the growth of Sri Lanka's ICT industry will hinge on its ability to develop its workforce and infrastructure. Within the telecommunication sector, a crowded market could potentially lead to further changes in the industry landscape. Market leaders are currently planning the launch of 5G technology, and much of the necessary infrastructure is already in place. The 5G is therefore likely to be on the market within the next few years and should considerably boost growth and support the development of advanced technologies.

- SLT emphasises sharing ICT infrastructure in the state drive towards a SMART Sri Lanka
- Building the National Information Infrastructure:
- ICT for Development: To use the emerging ICT infrastructure to make available a range of information sources and services to diverse community groups throughout Sri Lanka, including rural, unemployed, and poor; to empower them to function more effectively and efficiently and to develop their knowledge and skills. Thus, it will contribute towards improving their quality of life, increasing their employment potential, and leading to increased wealth and a reduction in poverty.
- E Society: The e-Society Programme will aim to use knowledge and information to move the 'centre of gravity' of power and influence back to the rural masses, while increasing awareness among rural communities on the benefits of ICT.
- ICT as an Enabler to Industrial Growth and Good Governance.



THAILAND

Global Innovation Index- Thailand

Thailand ranks No. 43 among the 132 economies featured in the GII 2022. The Global Innovation Index (GII) ranks world economies according to their innovation capabilities. Consisting of roughly 81 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation.

The following table shows the rankings of Thailand over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Thailand in the GII 2022 is between ranks 43 and 45.

Rankings of Thailand (2020–2022)

Year	GII	Innovation inputs	Innovation outputs
2022	43	48	44
2021	43	47	46
2020	44	48	44

- Thailand performs better in innovation outputs than innovation inputs in 2022.
- This year, Thailand's ranking in innovation inputs has dropped to 48th place, marking a decline from the previous year but remaining consistent with its position in 2020.
- In terms of innovation outputs, Thailand now holds the 44th position. This represents an improvement from the previous year and remains consistent with its ranking in 2020.

In 2022:

Thailand ranks 5th among the 36 upper middle-income group economies.

Thailand ranks 9th among the 17 economies in South East Asia, East Asia, and Oceania.

Global Competitiveness Index 2022 ranking – Thailand

Covering economies, the Global Competitiveness Index 4.0 measures national competitiveness—defined as the set of institutions, policies and factors that determine the level of productivity.

Rank	Economy	Score	Diff. from 2021	
			Rank	Score
33	Thailand		28	

Human Development Index 2022 ranking - Thailand

Thailand's HDI value for 2022 is 0.803 — which put the country in the “very high” human development category— positioning it at 66 out of 189 countries and territories. Between 2021 and 2022, Thailand's HDI value increased from 0.800 to 0.803, an increase of 0.003.

Country	Year	Index	Rank
Thailand	2022	0.803	66

National STI Policies in Thailand

National Science Technology and Innovation (STI) Policy and Plan

Higher Education, Science, Research and Innovation (HESRI) Policy and Strategy 2023-2027. Empower higher education, science, research and innovation. Transform the country for rapid and sustainable development. Enhance competitiveness with the value-creating economy and get ready for the future.

Objectives of HESRI Policy and Strategy:

- Enhance the competencies and skills of Thai people to boost competitiveness and promote sustainable development.
- Transform into a value-based, creative economy that ensures a stable local economy and self-sustainability.
- Promote sustainable development, address social and environmental challenges, and enhance resilience to a disruptive world.

Core strategies of HESRI Policy and Strategy:

- Increase economic competitiveness and sustainable self-reliance through a value-based, creative economy to be future-ready.
- Elevate social sustainability and environmental development to address challenges and adapt to the world's changing dynamics.
- Advance cutting-edge science, technology, research, and innovation to create new opportunities and prepare the country for the future.
- Develop manpower in higher education and research sectors as a foundation for sustainable and accelerated economic and social development.

National Nanotechnology Policy Framework

- Using nanotechnology to enhance the quality of life, health, medicine, and public health
- Using nanotechnology to enhance the agricultural sector and manufacturing industry
- Enhance energy security and environmental conservation through nanotechnology

- Human Resource Development (HRD) in nanotechnology
- Development of infrastructure and enabling factors

National Biotechnology Policy Framework

Promoting green innovation through biosciences as being pivotal to economic security, regional competitiveness and a healthier society. This vision is backed by a three-pronged approach. First, programs work in parallel with global, regional and national development priorities to foster a cohesive integration of biosciences into all aspects of development policy and planning. Second, the Framework emphasizes Thailand's competitiveness and self-sufficiency through biotechnology. And third, the Framework promotes private sector investment in biotechnology research and development particularly initiatives that deepen community engagement in biotechnology.

Food and Agriculture

- Help assure food security for a growing global population while also responding to the myriad of adaptation challenges posed by climate change.
- Advance market competitiveness and strengthen agricultural sustainability by increasing quality, productivity and innovation while reducing costs.
- Increase biotechnology's role in crop and livestock cultivation, especially through their inputs (e.g. fertilizer, herbicide, pesticide and feed) to raise food production efficiency and to contribute to environmentally responsible and sustainable agricultural production.
- Improve agricultural quality and productivity to increase yields in the sector's value chain through genetic improvement, quality and safety controls, nutrient labeling and product diversification and innovation.

Medicine and Health

- Promote public wellness, increase national self-reliance in healthcare and build competitiveness in markets where Thailand's biotechnology sector is poised to contribute.
- Expand the use of key technologies including: genomics, genetic modification and molecular biotechnology, production of active pharmaceutical ingredients (API), and new industrial production techniques, all with an aim to grow the following product sectors: medical diagnostic kits, drug development, vaccines and food supplements.
- Enable industry to generate leading products for the high-end market by supporting advances in innovation and by cultivating a stronger biotechnology support infrastructure.
- Propel Thailand to become a healthcare products hub within ASEAN.

Bioenergy

- Increase energy security by using biotechnology to develop alternative energy sources which are not in conflict with food production.
- Apply key technologies including genomics, microorganism physiology, genetic modification, high throughput screening, fermentation and industrial manufacturing technologies to increase bioenergy development.
- Targeting at three specific energy sources: biogas from wastewater and solid wastes, ethanol from cellulose and biodiesel from algae.

Bio-based Industry

- Strengthen industry's commitment to prioritize environmental protection by taking advantage of biotechnology's offerings that allow for cleaner, more efficient manufacturing processes.
- Emphasize the development of biocatalyst technologies with a focus on discovery and genetic improvement of microorganism strains to elevate fermentation technology.
- Accelerate establishment of biosafety safeguards for the use of genetically modified microorganisms in controlled conditions.
- Attract foreign investment and/or import fermentation and downstream process technologies so that local manufacturing gains a comparative advantage to cultivate bio-based industry development opportunities.
- Structure government procurement processes to support markets for bio-based products

Hi-tech exports in Thailand

In 2019, Thailand's high-tech exports amounted to approximately \$40 billion USD ([The Observatory of Economic Complexity](#)) ([TheGlobalEconomy.com](#)). This figure includes various categories of high-technology products such as electronics, integrated circuits, and other advanced technological goods. The strong performance in high-tech exports reflects Thailand's significant role in the global technology supply chain, particularly in the electronics and automotive sectors.

The value of Thailand's high-tech exports constituted about 26.6% of its total manufactured exports, indicating a robust presence in the global high-tech market ([Map - Lowy Institute Asia Power Index](#)) ([World Bank Open Data](#)). This performance was supported by significant export partners, with the United States, China, Japan, Vietnam, and Hong Kong being the top destinations for Thai high-tech goods ([World Integrated Trade Solution \(WITS\)](#)).

However, despite these strengths, Thailand faced challenges in maintaining its position relative to global and regional competitors. The country's export sophistication, which measures the complexity and value-added nature of its exports, had shown signs of stagnation. Thailand's

overall export sophistication was about 37% lower than the global frontier and 21% lower than the Asian frontier, highlighting the need for further advancements in its export portfolio to keep pace with leading economies in the region ([IMF eLibrary](#)).

High-technology exports (% of manufactured exports) in Thailand was reported at 22% in 2022, according to the World Bank collection of development indicators.

Country	Year	Value	Change %
Thailand	2022	22	3
	2021	25	3
	2020	28	4

Special economic programmes running now in Thailand

The Eastern Economic Corridor (EEC) Development Plan under scheme of Thailand 4.0 aiming to revitalise and enhancing of the well-known Eastern Seaboard Development Program that had supported Thailand as a powerhouse for industrial production in Thailand for over 30 years.

Chachoengsao, Chonburi and Rayong Provinces have been designated for the development of the Eastern Economic Corridor (EEC), a pilot project for the economic development of Thailand's Eastern Seaboard. Over the past 30 years, these three provinces have been developed to support the fast growing industries. It was the "eras of industrial revolution". In 1987, Map Ta Phut industrial estate was established and it was the beginning of the development of Thai heavy industry, such as petrochemical, auto and electronics industries. These eras are also called Thailand 3.0. Today, Thailand is ready to move forward to the era of Thailand 4.0.

The EEC area covers over 13,000 Km². The government has launched measures to support and accelerate the economic growth in the EEC, for instance, measures to develop public utilities, transportation systems, logistics, human resources, and investor's facilitation in the form of One-Stop Service Center.

In the future, the EEC will grow into a modern metropolitan, a hub of trade and investment, a center for regional transportation and logistics, a significant source for human resources, a tourist attraction and most importantly, the most modern Gateway to Asia.

National development policies connected to technology and industry in Thailand

- Higher Education, Science, Research and Innovation (HESRI) Policy and Strategy
- National Economic and Social Development Plan
- Bio-Circular-Green Economy Model (BCG)

Natural raw materials available in Thailand

- **Agricultural Products:** Thailand is a major producer of agricultural goods such as rice, rubber, sugar, and cassava. These are crucial both for domestic consumption and as export commodities.
- **Minerals:** The country has substantial mineral resources, including tin, tungsten, lead, zinc, and precious stones like sapphires and rubies. Thailand's mineral industry is particularly known for its production of gypsum and lignite, which are essential for construction and energy production respectively.
- **Forestry Products:** Thailand's forests provide timber, which is utilized in construction and furniture manufacturing. The country also produces non-timber forest products such as bamboo and rattan.
- **Fisheries:** Thailand has a thriving seafood industry, with extensive coastal and inland aquaculture. The country's exports include shrimp, fish, and various seafood products.

ICT infrastructure and connectivity in Thailand

Thailand Smart Cities

Thailand has defined seven key criteria for the development of smart cities, aimed at enhancing the quality of life, sustainability, and technological advancement. These criteria are:

- **Smart Environment:** Improving water and air quality, managing waste, and increasing green spaces to reduce CO2 emissions annually.
- **Smart Mobility:** Enhancing travel convenience, efficiency, and safety with eco-friendly solutions, aiming to significantly reduce road traffic fatalities.
- **Smart Living:** Providing services that enhance health and well-being, catering to an aging population, and improving public safety with extensive crime monitoring.
- **Smart People:** Increasing digital literacy and knowledge among citizens, encouraging the use of technology for economic and social benefits.
- **Smart Energy:** Improving energy efficiency and promoting the use of renewable energy, with a target of increasing renewable energy usage each year.
- **Smart Economy:** Boosting business efficiency and flexibility, with the goal of raising the average income per capita.
- **Smart Governance:** Developing public service systems for easy and quick access, aiming for significant public engagement in digital service platforms and public service development.

Thailand now has 35 smart cities in 25 provinces. 7 key cities involved in the smart city initiative include:

1. Bangkok
2. Phuket
3. Chiang Mai
4. Khon Kaen
5. Chon Buri
6. Rayong
7. Chachoengsao

Thailand Cyber University Project (Thai MOOC)

The Thailand Cyber University Project, known as Thai MOOC – for “Massive Open Online Courses” – is a cooperation between the Ministry of Higher Education, Science, Research, and Innovation, the Office of Information Technology and Communication Center, and numerous educational institutes to develop and manage online courses. It is a project that is driven by economics and the goal of a quality society employing digital technology.

The Massive Open Online Courses are considered a center for the national community, the center of Architectural Information Technology for an "Open System Education for Lifelong Learning" (Lifelong Learning Space) with teaching and learning modes that happen through various learning resources courses. One major purpose is to meet students' needs and to support students as they “upskill and reskill” to enhance their knowledge and skill for work, and to help develop all Thais in a new era of change.

The main objectives of the Thailand Cyber University Project include the following:

- Massive Open Online Courses management to support an unlimited number of students with information sources, learning profiles, “Credit Bank,” and a credit transfer system;
- Teaching and learning standards and guideline development and educational quality assurance system for the community;
- Building cooperation with different universities to develop and improve subject materials in MOOC, and collaborating on credit transfer between institutes;
- Course development, including materials and activities, following the quality standard and Massive Open Online Courses;
- Test bank development for courses-record assessment and evaluation in the MOOC system, collecting data for research, and developing better procedures for teaching and learning.

People who are interested can register and start by choosing more than 500 online subjects from more than 120 institutes and develop skills needed in life via <http://thaimooc.org>.

Thailand Digital Government Development Plan

Thailand 4.0 strategy prioritizes increased sustainable technology- and knowledge-based economic drivers, as well as increasing access to benefits of economic growth for all income groups. The strategy includes diverse foci such as economic growth, human capital, and environmental protection under a ‘Digital Thailand’ plan. Thailand’s e-Government 4.0 initiatives are part of this, and new technologies for the provision of public services are expected to support an overall digital transformation of Thai society, improve direct public and business services, and increase digital coordination across agencies. More broadly, they are also expected to improve public sector responses to key challenges in Thailand such as human trafficking, illegal fishing, low aviation standards, corruption, and insufficient public services.

The Cabinet approved the Thailand Digital Economic and Society Development Plan in April 2016. The plan is a guideline endorsing the use of technology and innovation as the main engine of Thai economy. Digital Government Development Agency (Public Organization) or DGA, as a pivotal promoter under the plan, has developed the Thailand Digital Government Development Plan. The objective of the Thailand Digital Government Development Plan is to strategically digitalize Thai government agencies, to deliver best citizen-centric services, with a high level of efficiency and transparency.

Goals of Digital Government Development Plan:

- Improving country’s digital government related ranking and Indices.
- Providing government services that response to country’s demands of all sectors rapidly, precisely, and paperless.
- Creating government data that easily accessed and improve government transparency and public participation.
- Developing digital government infrastructure that collect and manage integrated database, support cooperation among agencies, and efficiently provide government services.

Thailand’s Tech Start-Ups

According to the survey conducted on 100 startups from across Thailand in 2020, the top sectors of the startup industry were Business Service at 26%; and PropertyTech and Innovative Technology on music, arts and culture (MARTech) at 11%. The rest are Lifestyle 10%, Deep Tech 10%, FinTech 9%, AgTech & FoodTech 6%, MedTech 5%, EdTech & GovTech 5%, TravelTech 4%, and IndustryTech 3% respectively.

3 Tech Unicorns:

- Flash Express - Delivery and logistics
- Ascend Money – E-Wallet by TrueMoney
- LINE MAN / Wongnai - On-demand services (food delivery, products, and messengers)

Pao Tang - Thailand Digital Wallet App

Pao Tang is a comprehensive digital wallet app developed by Krungthai Bank in Thailand. Launched in January 2018, it quickly gained popularity, amassing over 40 million users by late 2020. The app is designed to facilitate a wide range of financial activities, serving as a key tool in Thailand's push towards a digital economy and improved financial inclusion.

Key features of Pao Tang include:

1. **Government Disbursements:** The app has been instrumental in distributing government funds, such as the 3,000-baht cash handout during the COVID-19 pandemic and a 10,000-baht digital wallet initiative aimed at stimulating economic activity.
2. **Investment Opportunities:** Pao Tang offers low-risk investment options like the 1-Baht Bonds, which are government savings bonds accessible even to small investors. This feature has democratized investment opportunities, making them available to younger and less wealthy individuals.
3. **Healthcare Services:** Through its Health Wallet feature, Pao Tang provides users with access to universal healthcare services, including appointment scheduling for medical screenings, vaccinations, and free COVID-19 antigen test kits.
4. **Digital Lottery:** The app includes a digital lottery feature, addressing issues of overpriced lottery tickets by offering them at a fixed price, thereby enhancing accessibility and transparency.
5. **Retirement Savings:** Recently, the app introduced a retirement savings feature for self-employed individuals. Users can automatically save a portion of their spending into the National Savings Fund, promoting financial security in retirement.
6. **Merchant Payments:** Pao Tang has been widely adopted by small merchants and street vendors, facilitating cashless transactions through mobile payments and QR codes.

Overall, Pao Tang has become a pivotal tool in Thailand's financial ecosystem, supporting both personal financial management and broader economic policies.

CONCLUSION

The BIMSTEC countries demonstrate significant, although varied, advancements in STI, emphasising their commitment to sustainable development, economic cooperation, and regional growth. The strong performance of India, which is evidenced by its 40th ranking in the GII and 37th in the GCI, highlights its robust institutional frameworks and innovation outputs. The notable improvements made by Bangladesh and Nepal in innovation and competitiveness reflect their strategic policy initiatives and developmental efforts. Sri Lanka and Myanmar also show promising growth in fostering innovation ecosystems, with Sri Lanka's high HDI ranking of 73rd underscoring its societal well-being. The stable innovation position and high HDI ranking of Thailand indicate ongoing efforts to enhance productivity and competitiveness. The distinct strategic approaches taken by each BIMSTEC country to enhance its STI ecosystem are in line with its developmental priorities and advance regional growth. A common trend towards shared technological advancement may be seen in the increasing innovation and competitiveness of Bangladesh, the consistent advances in the Human Development Index of Bhutan, and the moderate human development of Myanmar. Overall, these diverse yet concerted efforts foster regional collaboration, drive sustainable development, and achieve common goals. The STI trajectory of the BIMSTEC region emphasises the value of collaboration and tailored policies in boosting regional development and competitiveness internationally.