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THAILAND INVESTMENT REVIEW

MEDICAL DEVICE INDUSTRY

Capturing Healthcare
Opportunities





BOI NET APPLICATION

January – March 2021













Total Investment
401 Projects
US\$ 3,948.03 Million

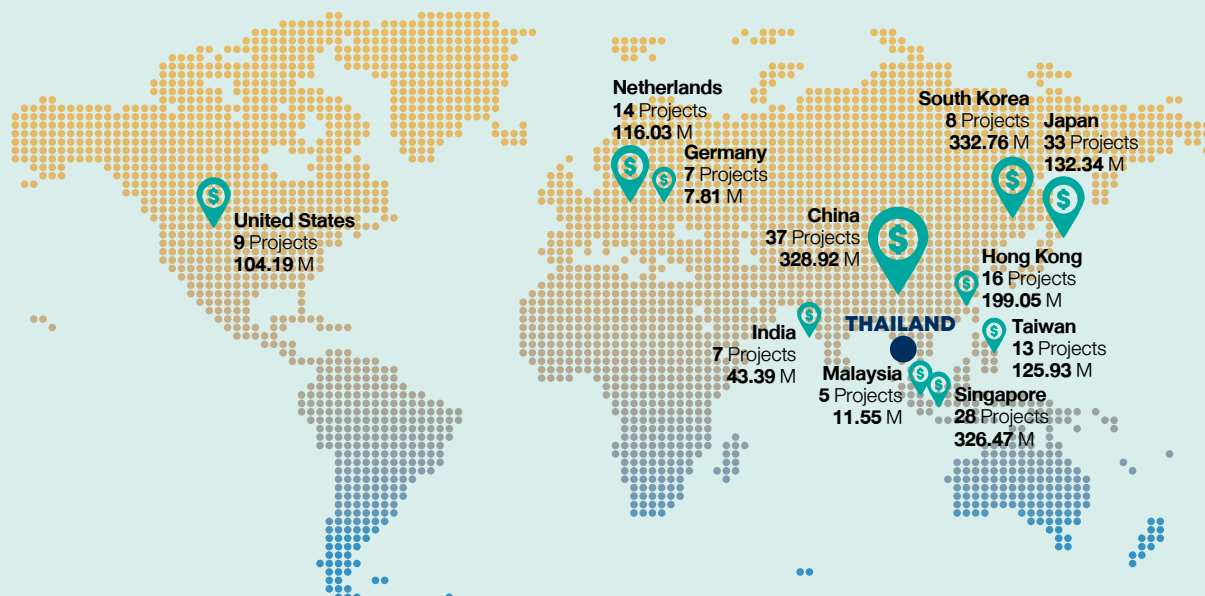


Total Foreign Investment
191 Projects
US\$ 1,967.58 Million

FOREIGN INVESTMENT BY TARGET SECTORS

First S-Curve		New S-Curve	
	Electronics 27 Projects 463.36 M		Biotechnology 1 Projects 0.53 M
	Agriculture & Food Processing 19 Projects 134.47 M		Digital 25 Projects 5.08 M
	Automotive 23 Projects 237.93 M		Aerospace 1 Projects 3.08 M
	Petrochemicals & Chemicals 13 Projects 186.28 M		Medical 14 Project 424.54 M
	Tourism 2 Projects 259.39 M		Automation & Robotics 1 Projects 0.09 M

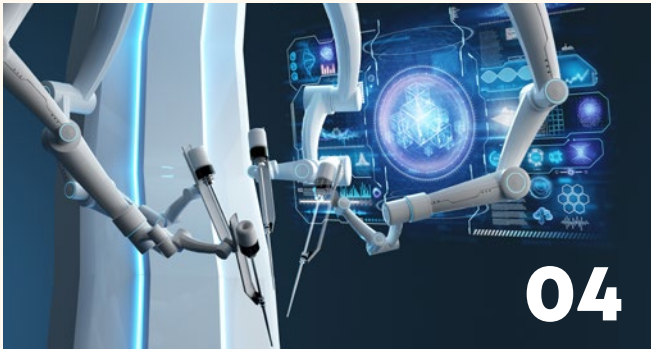
FOREIGN INVESTMENT BY MAJOR ECONOMIES



Unit: US\$ (US\$ = 31.50 as of 25 May 2021)

Note: Investment projects with foreign equity participation from more than one country are reported in the figures for both countries. Statistics on net applications are adjusted whenever applications are returned to applicants due to insufficient information. For more details, please visit www.boi.go.th

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STRENGTHENING THAILAND'S ECOSYSTEM FOR MEDICAL DEVICES

With the coronavirus expected to remain a persistent threat to the global population for many years to come and with healthcare technology rapidly advancing, Thailand is looking at tapping into the strategic advantages of its competitive industrial and healthcare supply chain and improved R&D resources to propel the country's medical device technology to the forefront of the global market.

Enhancing the competitiveness of the local medical device industry is a key component of Thailand's policy to promote a sustainable healthcare system and overall economic development. The policy will support the country's aim of improving not only the universal healthcare coverage it provides for its own citizens but also its competitiveness as a medical tourist destination by facilitating the development and utilization of new discoveries in life science and innovations in medical devices.

The Ministry of Higher Education, Science, Research and Innovation¹ estimated that Thailand's medical device industry expanded by 8-10% during 2019-2020, as the country established itself as the largest

exporter of medical devices in the Association of Southeast Asian Nations (ASEAN) region. Meanwhile the local manufacture of medical devices was also bolstered by a host of factors that included robust support from the public sector under its policy of promoting the development of the country's healthcare ecosystem to be a leading global medical hub by 2025, rising demand to treat illnesses affecting the aging population and novel diseases, as well as the increasing number of tourists seeking healthcare services in Thailand.

In the period before the pandemic, Thailand was drawing an average of 3 million foreign medical tourists per year. The success of the country's medical

tourism industry is supported by 69 hospitals which had attained accreditation from the Joint Commission International (JCI) in 2019, the largest number of JCI accredited hospitals in ASEAN and the second largest number in Asia, behind only China.

At present, there are approximately 1,500 medical device manufacturers operating in Thailand, benefiting from the country's comprehensive industrial supply chain which offers cost-effective sourcing of premium-grade raw materials. A study by Krungsri Research Intelligence² reported that Thailand's overall industrial supply chain was the 35th most competitive out of 64 countries worldwide, with coke and refined petroleum as well as

¹ <https://waa.inter.nstda.or.th/stks/pub/2021/bcg-in-action-medical-device.pdf>

² <https://www.krungsri.com/en/research/research-intelligence/thailand-sectoral-potential-2021>

rubber and plastic in 9th place and food & beverages and healthcare standing equally in 11th place.

In the results of its survey³ released in the second half of 2019, the Japan External Trade Organization (JETRO) indicated that Japanese firms in Thailand planned to source 61% of the parts and materials for their manufacturing activities from within ASEAN, including 55% from Thailand.

The overall competitiveness of Thailand's manufacturing standards are shown by its leading position at the regional level in many industries, including automation and robotics, automotive, biotechnology and electronics. These successes underscores Thailand's high level of craftsmanship, which is essential for the quality control needed in medical device manufacturing and medical engineering.

Ramping up the Ecosystem of Innovation

Thailand's policy on healthcare sector development focuses on two key areas. Ramping up technology development through investment in innovation and quality testing facilities will enable local manufacturers to test their products, while foreign

investment is being promoted to enhance the technology capacity of the supply chain.

As one measure to support local innovators and manufacturers in scaling up their R&D to international standards, the Thai government has created a national innovation list which registers innovations by companies operating in Thailand in many industries including medical devices. With registered products eligible for procurement by state hospitals, Thailand targets having around 30% of all medical device and pharmaceutical products procured by state hospitals to be locally-produced by 2025. Following the creation of the list in 2015, there are currently 257 medical devices active on the national innovation list, out of which 215 are pharmaceutical products, 26 medical devices and 16 medical consumables.

To improve the capacity building of research in the medical field, Thailand has encouraged greater collaboration among the public sector, private sector and academic institutes and promoted the supply of medical researchers. In terms of research and innovation facilities, Thailand's efforts to facilitate local innovation will focus on building



local standard testing centers and labs for research on medical campuses and in the Eastern Economic Corridor (EEC), the country's pilot high-technology special economic zone, located in the Eastern region.

BOI Incentivizes Healthcare Investment

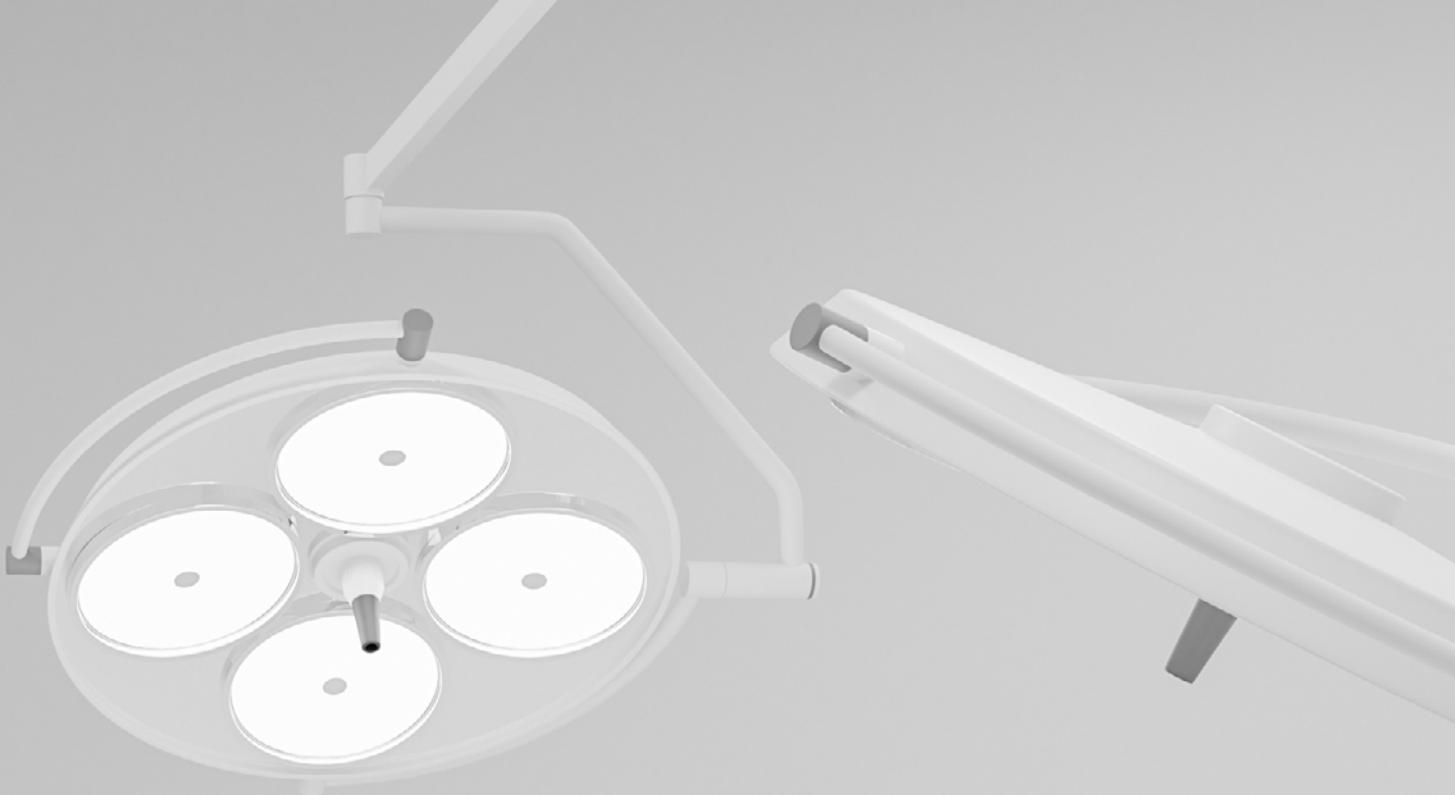
Under its policy to attract foreign investment to help upgrade technology in the local medical device industry, the Thailand Board of Investment has introduced both non-tax and tax incentives aimed at facilitating the development of the entire healthcare and medical industries ecosystem. The BOI's support covers activities ranging from the manufacture of medical devices and pharmaceutical products to the development of healthcare facilities and clinical trials, with an additional incentive offered to R&D and productivity enhancement.⁴

As the manufacture of medical devices is considered a priority activity, the BOI is granting corporate income tax exemption of 8 years on the manufacture of medical devices classified as high-risk or high-technology, 5 years of CIT exemption on other



³ https://www.jetro.go.jp/thailand/topics/_449168.html

⁴ https://www.boi.go.th/upload/content/Medical_Webinar_Europe_SG_June20.pdf



medical devices and 3 years of CIT exemption on medical devices made of fabrics or fibers.

To promote Thailand's operation of contract research organizations (CRO) and clinical research centers (CRC), the BOI is also offering 8-year CIT exemption to organizations which collaborate with and employ Thai researchers.

For manufacturers of active ingredients, the BOI is offering 8-year CIT exemption on ingredients used in targeted medicine and 5-year exemption for ingredients used in traditional targeted medicine. Meanwhile, operators of medical centers for excellence are entitled to 8-year CIT exemption.

To facilitate advancement in life science research, the BOI has made additional incentives

available for organizations which operate in the Genomics Thailand project at Burapha University in the EEC. Eligible organizations will benefit from an additional 50% CIT deduction for two years on top of the baseline 5-8 years of exemption.

As Thailand targets becoming an innovation-driven economy, the BOI has recently announced enhanced tax incentives to drive business to increase investment in R&D in local operations. As such, the BOI is now offering longer tax breaks to a maximum of 13 years for example projects that invest or spend at least 200 million baht or 1% of total sales from the first three years of operations will be entitled to one-year additional CIT exemption, with no ceiling. ■

MEDICAL DEVICES TO LEVERAGE THAILAND'S COMPETITIVE SUPPLY CHAIN

With technology for medical devices continuing to evolve in line with rising demand, Thailand remains focused on promoting technology and innovation in its medical device industry, leveraging the country's global strengths as a top medical destination with a well-established and thriving industrial supply chain.



The database of Global Trade Atlas showed that the international trade of medical devices has continued to grow during the COVID-19 pandemic, with the trade volume standing at approximately US\$830 billion in 2020. Interestingly, the value of global exports outstripped imports at approximately US\$530 billion versus US\$300 billion, respectively. Durable medical devices accounted for the majority of the global exports at approximately 75%, followed by single-use products and reagents (approximately 20%) and test kits (approximately 5%).

With a globally competitive manufacturing sector and efficient business environment, Thailand has attracted multinational companies

from all over the world to invest in the manufacture of medical devices in the Kingdom. The Thai government's continued support for increasing the use of locally produced medical devices has also contributed to the development of many homegrown local manufacturers.

As a result, Thailand has continued to be a key supplier in the global medical trade. Thailand is ranked 20th worldwide, 6th in Asia, and 3rd in ASEAN after Singapore and Malaysia for exports.

Thailand's export of medical devices totaled approximately US\$5 billion in 2020, nearly double the value of its imports of approximately US\$2.6 billion. The largest share

of the country's export value was gloves, accounting for 52% of the total, followed by optical lenses, syringes, needles, catheters and cannulas. Key destinations for the exports were the United States, Japan, the Netherlands and Germany, reflecting the presence of multinational companies in Thailand's medical device industry.

In terms of imports, Thailand ranked 28th globally, 6th in Asia, and 3rd in ASEAN. During 2016 to 2020, the compounded annual growth rate (CAGR) of the export of medical devices was approximately 13% compared to the import CAGR of 6%.

Single-use devices and durable medical devices, such as x-ray machines, ultrasound equipment, electrocardiograms (ECG) and electroencephalograms (EEG), represented the largest share of imports, accounting for 43% and 40% of total value, respectively, with the United States, China, Germany and Japan the main sources of these imports.

With the country's reliance on imports of high-technology medical devices, the Thai government is determined to strengthen the country's ecosystem of local medical device technology to produce innovations and move the country up the global value chain by promoting local R&D and investment.

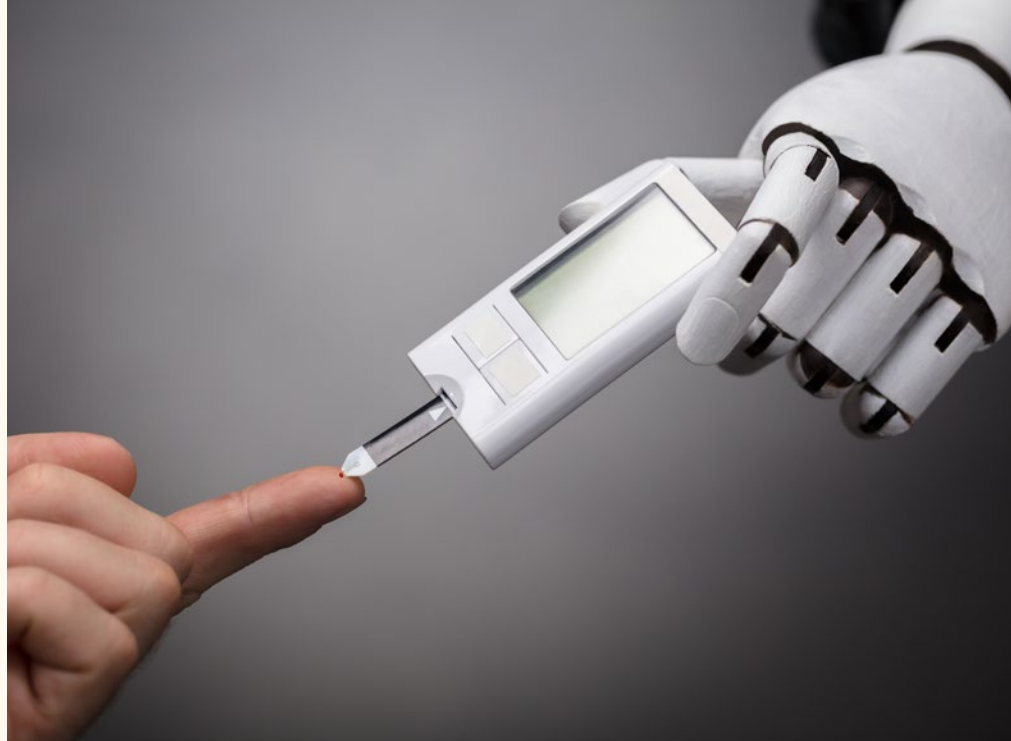


A Growing Investment Hub

Driven by the country's positioning as the world's major global medical service destination and its well-regarded universal healthcare coverage, Thailand is a solid market for the medical device industry. The healthy demand coupled with government support in providing modern infrastructure and facilitating R&D and the commercialization of innovations have attracted multinational companies to use the country as a manufacturing and operations base.

In 2020, the Thailand Board of Investment received a total of 77 applications for investment incentives with a combined investment value of approximately US\$500 million. Medical devices in the categories classified as low risk received the most investment, followed by medical devices with fabric components, parts of electronic control and measurement devices, healthcare facilities, non-woven fabric medical devices, healthcare facilities, excellence centers and medical foods.

In light of the threat from the coronavirus, the Ministry of Industry has introduced urgent measures which focus on upgrading the technology in local medical devices to ensure adequate supplies are available to cope with the pandemic. The measures center on promoting product prototypes related to AI and IoT as well as products related to rehabilitation, prognosis and treatment, such as Power Air Purifying Respirators (PAPR), ventilator testers, telemedicine systems, AI systems for pulmonary analysis and dental aerosol suction devices. The prototypes are developed through collaboration between academic institutes, medical personnel and related agencies.



The Ministry of Industry's Medical Devices Intelligence Unit showed that the local production of medical devices accelerated in 2020, with the manufacture of rubber gloves rising by 17%, syringes by 2% and others by 8%. Only the production of optical lenses declined from 2019.

From the ministry's own survey, Thailand had 513 active entrepreneurs in the medical device industry at end of 2020. Of these, 28% were manufacturers, followed by 23% distributors, 17% importers, 9% exporters, 8% parts producers and 7% service providers.

The majority of Thai manufacturers (43%) produce single-use devices, followed by durable devices (28%), supporting services (6%), reagent and test kits (6%) and others (11%).

It is estimated that small- and medium-sized enterprises account for 80 to 96% of the total entrepreneurs in Thailand's medical device industry.

Approximately 30% of the medical devices produced in Thailand were sold domestically with the rest exported.

According to Krungsri Research Center, the domestic sale of local medical devices grew by 7% and exports expanded by 6% from 2015 to 2018. The research center forecast that the domestic sale of locally-produced medical devices will grow by 7% and exports will increase by 5% from 2021 to 2022.

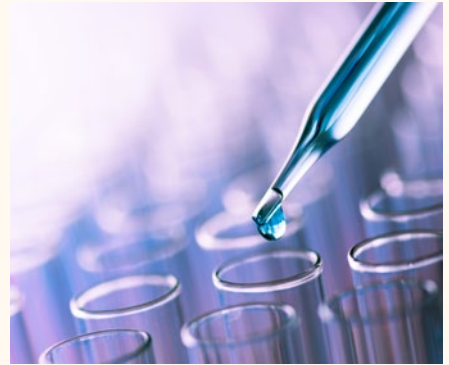
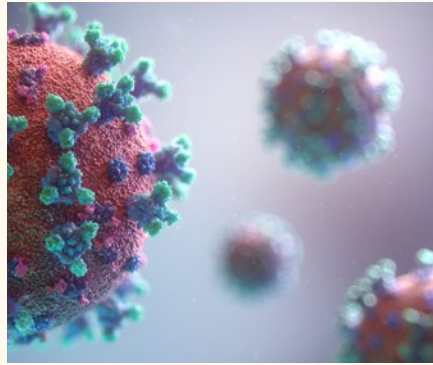
The government's promotion of medical tourism in Thailand since 2003 has been a key driver for the development of the country's healthcare ecosystem. Thailand recorded a total of 2 million medical tourists in 2017, compared with 1.4 million in 2015.

While the majority of Thailand's exports of medical devices are single-use products and medical consumables, a few Thai companies have begun to stake a claim in the global market. Among them is a manufacturer of elderly companion robot technology that utilizes AI, with sizeable sales already generated in Japan. As the development of AI technology continues, the same company is developing a tool that analyzes a patient's breath to diagnose the risks of many types of cancers with high rate of accuracy.

Promising Prospect for Biopharmaceuticals

The COVID-19 pandemic has prompted countries across the world to ramp up their vaccine research and development as the coronavirus is expected to remain endemic with outbreaks of mutated variations. Many companies in the Thai biopharmaceutical industry are making good progress with vaccine development against the SARS-CoV-2 virus which causes the pandemic.

Siam Bioscience Co., Ltd. is one of 25 companies worldwide that UK-based AstraZeneca has licensed to produce its COVID-19 viral vector vaccine. In May, AstraZeneca announced that the test batches of the vaccine made by Siam Bioscience passed the quality testing at its designated laboratories in Europe and the US. The contract between the two companies is for the production of 200 million doses of vaccines to



chula.ac.th



meet the demand across Southeast Asia.

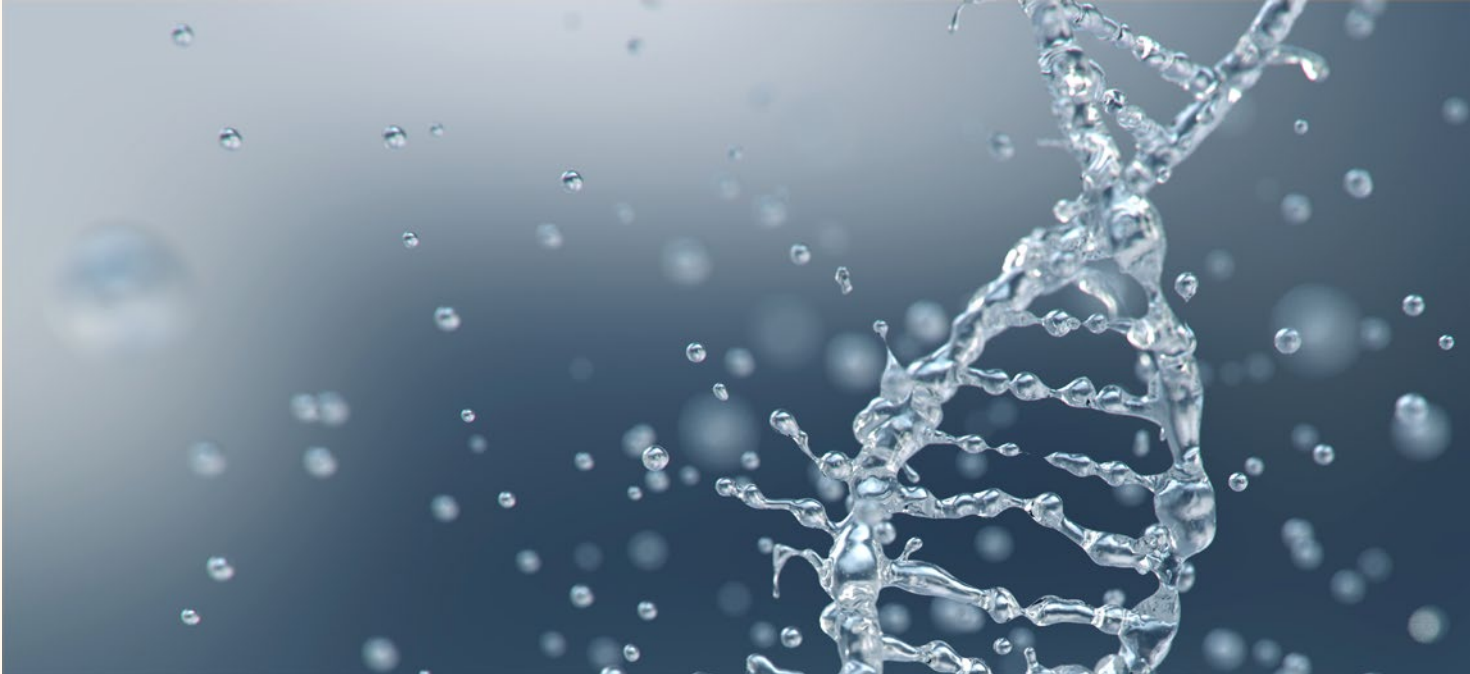
It is also worth noting that Thai medical researchers at the Vaccine Research Center of Chulalongkorn University's Faculty of Medicine have made progress in the development of a vaccine based on Messenger RNA (mRNA) technology for the SARS-CoV-2, with the second phase of clinical test in humans scheduled in August 2021. If successful, the research center is expected to roll out mass production of the "ChulaCOV19" vaccine in mid of 2022 to counter new mutated variants of the novel coronavirus.

BioNet-Asia Co., Ltd. is developing a DNA-based vaccine against the coronavirus and is currently preparing to conduct the second phase of clinical tests. Meanwhile Baiya Phytopharm Co., Ltd., a startup from Chulalongkorn University's Faculty of Pharmaceutical Sciences, is developing a vaccine using bacteria from plant leaves.

The vaccine has passed testing on laboratory animals and is schedule for human trials to start in 2022.

To further enhance the capacity of state and private research organizations to develop vaccine prototypes and production capacity to serve the needs in ASEAN countries, in early 2021, the Thai government announced a grant project worth US\$90 million through the National Vaccine Institute.

The grant recipients included Bionet-Asia, Siam Bioscience, Baiya Phytopharm, King Mongkut's University of Technology Thonburi, the National Science and Technology Development Agency, the Vaccine Research Center at Chulalongkorn University's Faculty of Medicine, Chulalongkorn University's National Primate Research Center, the Government Pharmaceutical Organization (GPO) and GPO-Merieux Biological Products. ■



PROMOTING MEDICAL TECHNOLOGY INNOVATIONS

Under its development target of becoming an international healthcare and medical hub by 2036, Thailand is currently aiming to reach the next level of medical and wellness services by promoting precision medicine for the treatment of more complex illnesses, such as cancer and genetic-related diseases.

The action plan focuses on improving R&D and skill training technology, with the local medical device industry also expected to benefit from the cutting-edge innovations and R&D facilities in the Eastern Economic Corridor (EEC) which covers the three provinces of Chachoengsao, Chonburi and Rayong in the country's Eastern Region. As Thailand's pilot industry 4.0 special economic zone, the EEC provides support for all of the country's target high-tech industries with facilities that promote the whole R&D and innovation development process, including the Startup and Innovation Center, National Quality Infrastructure and Translational Research Infrastructure.

One project that is fundamental to this plan calls for the Public Health Ministry establishing the Thailand Genome Sequencing Center¹ in the EEC as a facility to provide clinical services for patients from across Southeast Asia and beyond. The planned genome sequencing center² will be located at Burapha University in Chonburi province, with the laboratory space occupying approximately 1,700 square meters. Genome sequencing of 50,000

Thais will be conducted at the lab and their DNA data will be used to build a genomics library under the supervision of the Health Systems Research Institute (HSRI)³. The first of its kind in ASEAN, the genomics library will utilize the database to enable more effective development of pharmaceutical and healthcare products.

Of the required investment budget of US\$ 50 million, half is expected to be financed by the Thai government with the rest to come from local and foreign investors. Local leading hospitals and companies have shown interest in partnering with multinational companies to create a consortium to run the lab. The HSRI and EEC Office is in the process of implementing the bidding procedure.

The Excellence Center for Genomics and Precision Medicine at King Chulalongkorn Memorial Hospital has provided assurances that it could support and strengthen the whole genome sequencing project. On top of that, the BOI and the EEC office have provided tax and non-tax incentives to foreign businesses and experts to work in the EEC.

¹ <https://www.boi.go.th/upload/content/EECGenomicon.pdf>

² <https://www.nstda.or.th/en/news/news-years-2020/1057-genomic-medicine-in-thailand.html>

³ <https://www.hsri.or.th/en/people>



wangchanvalley.com



ptpic.com

Wangchan Valley, a smart city project in Rayong province is another supporting facility in the EEC. Developed as a base for research, development and innovation, Wangchan Valley's mission also includes operating the Kamnoetvidya Science Academy⁴ which offers world-class education in science, mathematics and technology through scholarships for students in years 10, 11 and 12 to prepare the talents required for the high-tech industries in the EEC and across the country.

In a related development, Thammasat University⁵ has also confirmed its plan to develop a Total Digital Healthcare Solution at its Pattaya campus in Chonburi province. Aiming to enhance Thailand's competitiveness in becoming the regional medical hub, the facility will include excellence centers in medical services, digital hospitals, an integrated research center and community-based healthcare solutions. Under the EECmd Vision 2024, the EEC aims to promote knowledge sharing and networking with local and international institutes to enhance the skills of healthcare researchers and personnel as well as to push forward innovation for precision medicine and medical devices.

With a focus on healthtech, state-owned Mahidol University has introduced Salaya Startup Town which houses a comprehensive ecosystem of lab and R&D space for engineering, biotechnology and healthcare technology. The project supports startups and technology incubation by providing working space for engineering innovations and advanced medical robotics as well as its Center for Biomedical and Robotics Technology⁶, HealthCare Logistics Big Data, UN Innovations Lab and Center of Logistics, Management and Healthcare Supply Chain.

In the capital city of Bangkok, around 20 medical academic institutions and research houses have signed an agreement to strengthen their collaboration on research and human clinical trials under the "Multicenter Medical Innovation Clinical Trial" project. The institutions which have formed a network called "the Yothi Medical Innovation District" have worked together on the development of medical devices such as a portable chest x-ray and its application for patients with non-communicable diseases. ■

4 https://www.kvis.ac.th/About_EN.aspx

5 <https://pr.tu.ac.th/pattaya/e-book/index.html>

6 <https://www.bartlab.org/>

Snapshot of Thailand's Medical Industry


Medical Device Market in 2019: US\$ 26.67 billion
Medical Device Export in 2020: US\$ 3.36 billion

27,367
Healthcare Providers

386
Private Hospitals

69
JCI Accredited Hospital

3.5 Million
Medical Tourists



Expected Growth for Medical Device Market
8 to 10 percent

About 600 Thai-based Companies located in the countries

USD 600 Million Spending on Medical Tourism

Medical Device

- Reagent and Test Kits
- Medical Robotics
- Hospital Hardware

Pharmaceuticals

- Generic Drugs
- Biopharmaceuticals
- Vaccines

Medical Services

- Telemedicine
- Rehabilitation Center
- Clinical Trial

World's 5th biggest Medical Tourism Market

Medical Device

- Reagent and Test Kits
- Medical Robotics
- Hospital Hardware

Pharmaceuticals

- Generic Drugs
- Biopharmaceuticals
- Vaccines

Medical Services

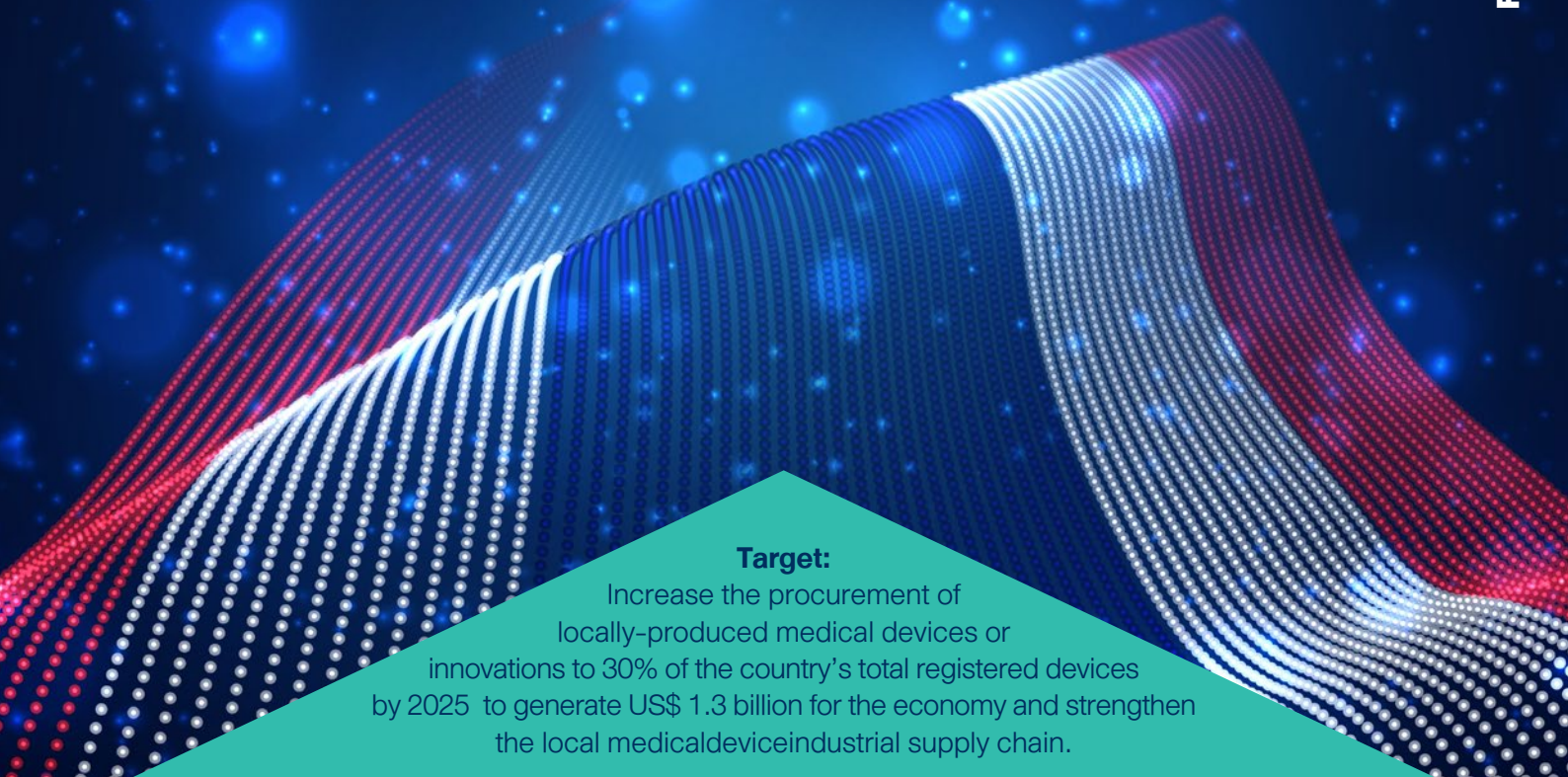
- Telemedicine
- Rehabilitation Center
- Clinical Trial

Thailand is ramping up investments in national quality infrastructure
<https://nqi.go.th/nqi>

Source: Bolliger and Company (Thailand)
 * The Bank of Thailand's official exchange of 32.05 THB for 1 USD



Thailand's Strategy for Developing its Medical Device Industry



Target:

Increase the procurement of locally-produced medical devices or innovations to 30% of the country's total registered devices by 2025 to generate US\$ 1.3 billion for the economy and strengthen the local medicaldeviceindustrial supply chain.

Medical Consumables and Equipment

Durable Medical Devices and Medical Software

Reagents and Test Kits



Strategy 1 : Achieve a good balance between local supply and demand through a reverse engineering approach

Strategy 2 : Prepare for mass production by scaling up specifications, standards and price through leveraging the government's innovation promotion mechanism and public sector procurement based on the national innovation list

Strategy 3: Lower import tariffs for components and raw materials to be used in local manufacturing to zero and promote technology localization

Strategy 4: Enhance the capacity of local personnel in R&D and innovation as well as local entrepreneurs

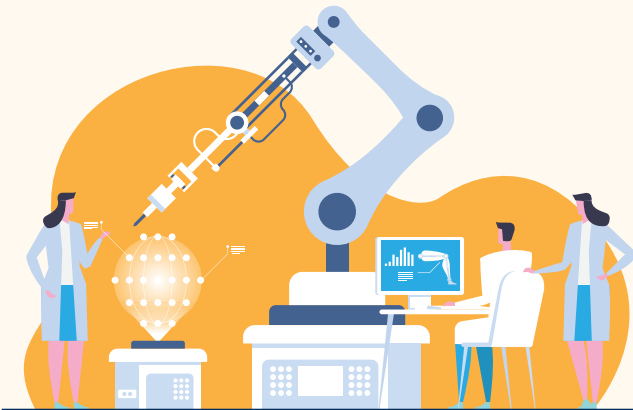
Strategy 5: Integrate the support mechanisms of all stakeholders to ensure adequate resources, holistic facilitation and networks

Source: The BCG Model Implementation Committee on Medical Devices (Under the supervision of the Ministry of Higher Education Science and Research Development)

Measures to Upgrade Capacity of Medical Device Industry



1: Establish funds to push forward the standard, sandbox and local innovation list of manufacturers based in Thailand to meet the requirements of the public sectors



2: Set up an institute to test the standards, technology and innovations of medical devices for upgrading local testing standards to the international level for medical software, medtech systems, taxonomy, digital, IoT and robotics enabled services. Create a certifying system for labs and device testing to strengthen Thailand's positioning as a key medical device production and Original Equipment Manufacturer (OEM) base in ASEAN.



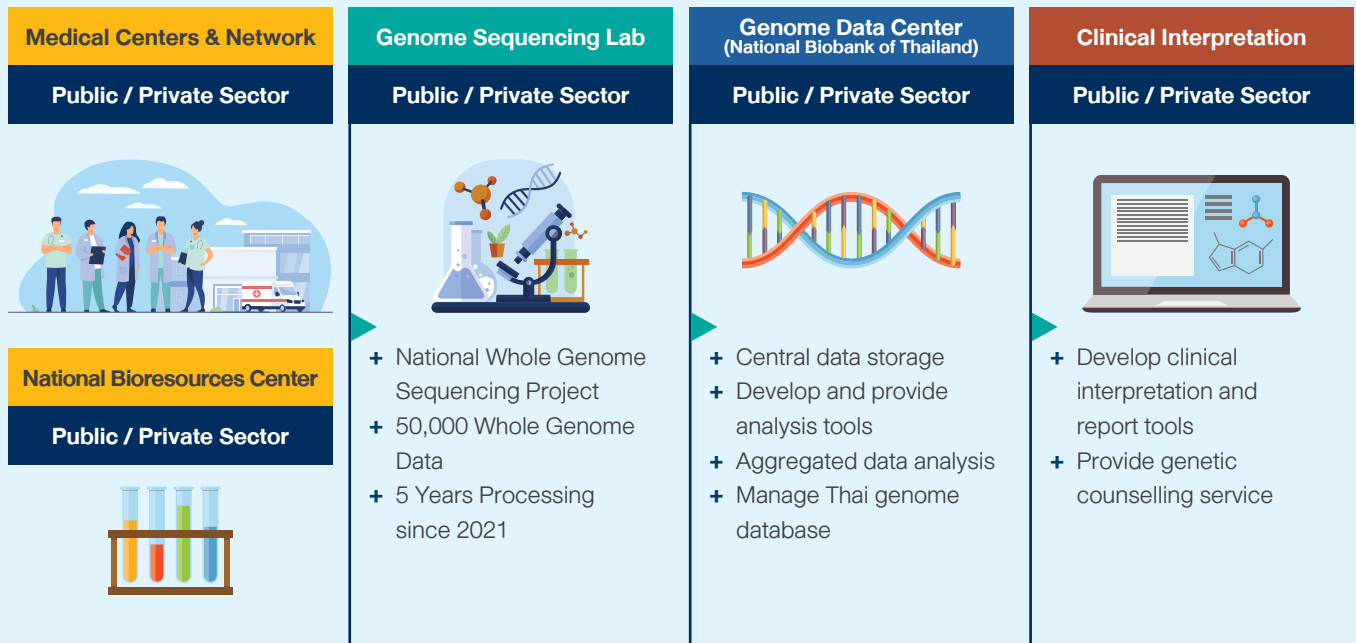
3: Establish a national institute for medical device technology to integrate the operations of all related agencies in a holistic manner, enhance their collaborations on the R&D of medical devices, promote the translation of R&D into commercial usage, and act as a central agency to manage and move the country's medical strategy forward.

Source: The BCG Model Implementation Committee on Medical Devices

New Ecosystem for Healthcare and Wellness in the EEC



- Genomics Thailand Integration and Execution Plan (2020–2024)
- 1st Step for Thailand to develop Genome Sequencing Center Project and establish Genome Sequencing Lab in EEC
- Focus on Cancer, Non-Invasive Prenatal Testing (NIPT) and Rare Diseases



Business Opportunities

Therapeutics

- Precision Medicine**
- + Genomic Medicine
 - + Regenerative Medicine, etc.
-
- Regenerative Medicine**
- ATMPs**
- + Cell Therapy
 - + Gene Therapy
 - + Tissue Engineering
 - + Combined ATMP
- Biosimilar**
- + Small molecule & Biologic drugs

Manufacturing

- Digital Health**
- + Advance Health and Wellness Devices
 - + Telemedicine
 - + Bioinformatics
-
- Personalized medicine**

R&D

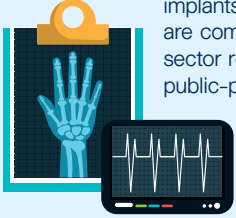
- Clinical Trials**
-
- Pharmacogenomics**
-
- Drugs Discovery**

BOI's Tax Incentives for the Medical Device Industry

1 Manufacture of high-risk or high-technology medical devices

for example x-ray machines, MRI machines, CT scan machines and implants or medical devices that are commercialized from public sector research or collaborative public-private sector research

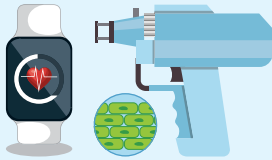
8-year CIT Exemption*



2 Manufacture of other medical devices

(except for medical devices made of fabrics or fibers)

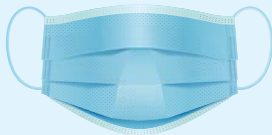
5-year CIT Exemption



3 Manufacture of medical devices made of fabrics or fibers

such as gowns, drapes, caps, face masks, gauze and cotton wool

3-year CIT Exemption



BOI's New Tax Incentives to Support the Healthcare Ecosystem

1 Contract Research Organization (CRO):

activities related to clinical research with Thai research associates and collaboration with Thai organizations

8-year CIT Exemption**



2 Clinical Research Center (CRC):

Preclinical research or clinical research practice with Good Clinical Practice or International Conference on Harmonization standard

8-year CIT Exemption**



3 Manufacture of Active Pharmaceutical Ingredients and Targeted Medicine

8-year CIT Exemption



4 Manufacture of Traditional Targeted Medicine

5-year CIT Exemption



5 Medical Centers of Excellence, Hospitals in the designated provinces

8-year CIT Exemption



6 Traditional Thai medical centers, medical transportation services

5-year CIT Exemption



7 Genomics Thailand:

The BOI has included investment under Genomics Thailand projects at Burapa University in the Eastern Economic Corridor as an eligible activity for additional incentives to promote precision medicine

- + Additional **50%** CIT deduction for **2 years** on top of CIT exemption of **5-8 years**
- + Investment in technology and innovation is eligible for an additional **1-year** CIT exemption on top of **10-year** CIT exemption

* no limit for maximum exemptible CIT for projects involving R&D and innovations / ** no limit for the maximum exemptible CIT

CONDUCTIVE ENVIRONMENT FOR THE MEDICAL DEVICE INDUSTRY

“

The medical device industry is one of the strategic sectors that the Thai government has identified as having high potential to drive long-term economic development with further efforts to promote innovations and investment. Given that medical devices are a challenging and dynamic industry, Thailand’s strategy focuses on attracting more foreign investment for technology transfer and to facilitate R&D which will strengthen the whole industry.

”

Mr. Preecha Bhandtvej
President of the Thai Medical
Device Technology Industry Association



Thailand’s competitive international medical services, its quality universal healthcare coverage, and the growing health consciousness of its citizens have all driven the growth prospects of the country’s medical device industry and attracted both local and foreign investment. The country’s well-established industrial supply chain and business-friendly environment have also been significant factors in persuading multinational corporations and foreign investors to select Thailand as a manufacturing and export base for their medical devices.

Realizing the growing demand for medical devices and Thailand’s potential for enhancing the technology in medical device manufacturing, the Thai government has highlighted medical devices as one of the existing S-Curve industries in which the country will continue to focus its resources.

Mr. Preecha Bhandtvej, President of the Thai Medical Device Technology Industry Association (THAIMED), shared with us his views on Thailand’s commitment to promoting R&D and foreign investment in the medical device industry.

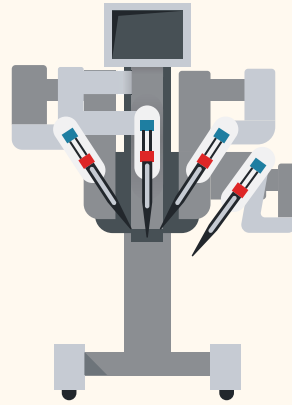
Q: What is the role of the medical device industry in Thailand's economic development?

A: The medical device industry is one of the strategic sectors that the Thai government has identified as having high potential to drive long-term economic development with further efforts to promote innovations and investment. Given that medical devices are a challenging and dynamic industry, Thailand's strategy focuses on attracting more foreign investment for technology transfer and to facilitate R&D which will strengthen the whole industry.

In this regard, Thailand has supportive environments from both the demand and supply sides. From the demand side, Thailand will need more high-technology medical devices to serve the country's universal healthcare coverage which is now offered to all of the population through three platforms. This policy, coupled with the aging demographic—with the total number of people older than 60 years old currently standing at 18%—is expected to create a large market for medical devices.

As a result of its strong industrial supply chain and competitive business environment, Thailand has received investment from many multinational companies for the manufacture of medical devices, while number of local medical device manufacturers is also growing.

The country is a net exporter and the largest exporter of medical devices in ASEAN. Nevertheless, the high volume of imports also reflects the fact that the country has room for improvement in terms of substituting the import of high-technology medical devices, such as CT scan machines, ultrasound machines, magnetic resonance imaging machines, cardiac monitors, critical care products, hemodialysis ventilators, physiotherapy equipment,



robotics, surgical products, telemedicine equipment, orthopedic products and implants.

At the same time, Thailand realizes its potential to improve the economic value and growth from the increasing need for medical devices, especially in the aspect of high technology. As such, the country is focusing on incubating local innovations, strengthening local skills, and promoting technology transfer from foreign investments.

One of the Thai government's promotions to support local innovations is that state hospitals will dedicate 30% of their procurement budgets to local medical device innovations and the annual improvement of the national medical device innovation list.

Thailand's target of increasing the number of medical tourists visiting the country and growing its number of world-class hospitals—which are internally accepted for attentive care and high-quality healthcare services at more affordable prices—will also help underpin the demand for medical devices.

On top of that, foreign investors can take advantage of support from the country's robust science and development ecosystem for clinical research. This includes agencies under the supervision of the Ministry of Higher Education, Science Research and Innovation; the Ministry of Public Health; the Ministry of Industry; and the

Ministry of Commerce. Thailand also has organizations that support lab testing, such as the National Laboratory Animal Center, the Electrical and Electronic Product Testing Center, the Department of Medical Sciences, the Department of Science Service, the Royal Thai Army Chemical Department, and the Material Properties Analysis and Development Centre. In terms of design and development, investors can seek support from the National Science and Technology Development Agency and the Plastics Institute, while the Thai Industrial Standards Institute and the Department of Health Service Support can assist foreign investors or partners to make sure that their products meet the relevant safety standards.

The medical device industry is one of the key targeted industries eligible for the Thailand Board of Investment's comprehensive support, including both tax and non-tax incentives.

Another benefit Thailand offers multinational companies is the strategic advantage of highly competitive logistics for exporting to ASEAN countries, while its large pool of highly skilled human resources include biomedical engineers, researchers, and professors all add to the strong supportive ecosystem.

Q What competitive advantages does the Thai business ecosystem have in attracting foreign investors?

A: The Thai government has focused on the Eastern Economic Corridor (EEC) which will provide cutting-edge innovation platforms and skilled personnel for medical device and pharmaceutical development. Equipped with excellent medical centers, digital healthcare facilities, academic

institutes and research centers, the EEC is expected to enhance the quality of the personnel and R&D in the industry. The EEC is committed to ensuring there is an adequate supply of human resources in healthcare-related areas such as biomedical engineers, researchers, scientists, economists, doctors, nurses, medical professionals, and pharmacists and to providing a platform for these experts to work together.

For the medical device industry, currently we have around 3,800 medical device companies in Thailand, including import-export businesses and manufacturers. We have nearly 400 medical device manufacturers, but we still need more high-technology companies and partners to conduct research on new lines of products to serve the growing and increasingly complex needs of the Thai and ASEAN population.

Thailand is a leading medical tourism destination in the ASEAN region. It has become famous for its excellent medical facilities and healthcare for foreigners. The factors generating competitive advantages for Thailand are cost savings, internationally accredited medical facilities, highly qualified medical professionals, no waiting lists, state-of-the-art technology, a range of tourism products, and Thai-style hospitality with excellent services.



Q: Do you think Thailand has coped adequately enough with the rising demand for medical devices during the pandemic?

A: When the COVID-19 pandemic broke out last year, Thailand suffered from a shortage of medical devices and equipment, such as PPE, surgical masks, N95 masks, coverall gowns, Covid-19 lab testing & reagents, infrared temperature screeners and gloves to protect our frontline practitioners. We can produce enough to cover our needs this year. Even so, due to the severity of the pandemic, Thailand admittedly still has supply constraints on devices such as ventilators, respirators, high-flow oxygen therapy machines, oxygen concentrators, nitrile gloves, fingertip pulse oximeters and negative pressure rooms, just like many other countries around the world. We still rely on imports, and this reflects the need to improve our production capacity to substitute imports in the future.

To cope with the ongoing pandemic and other healthcare crises in the future, the Thai government and the private sector, including THAIMED, have highlighted the technology and products that need urgent investment and R&D, both from local and international investors.

Q: What roles have the government agencies and the BOI played in supporting investment in the medical device industry in Thailand? What is THAIMED's role?

A: The BOI has played an efficient role in advising investors where and how they can do business and open manufacturing and operation facilities in Thailand. We have also provided both tax and non-tax incentives for businesses in Thailand's targeted industries. During the pandemic, the BOI has maximized the use of online platforms to provide information on targeted industries and incentives as well as introducing the online submission of documents for investors, so it is much easier for investors to interact with the BOI.

THAIMED is a non-profit association of medical device manufacturers and importers with a focus on keeping members abreast of the relevant standards and regulatory requirements as well as strengthening the network of the investors, Thai manufacturers and public agencies. Many multinational companies and embassies have contacted us for support in seeking partners and information. We will continue to organize exhibitions and business matching forums regularly as we have found they are an effective approach for our work. ■





CHIANG MAI'S RED LIGHT THERAPY

Hang Dong is a tranquil town in Chiang Mai, the Northern Thai province whose rolling hills, diverse horticulture and traditional wooden crafts make it extremely popular with tourists. Hang Dong also happens to be home to the headquarters and manufacturing base of Recharge Health, an innovative medical device startup that is making a name for itself on the global stage.



“

For us, Thailand was a natural selection because of the temperature, education level of the workforce, overall safety, quality of infrastructure, culture and the people. With the BOI's support, we are able to hire people and experts from all over the world. We have about 29 people in Hang Dong now with about 15 different languages.

”

Mr. Christian Barmen
Co-Founder and CEO of Recharge Health

Lured by Chiang Mai's mixture of urban convenience and simple rural life, Mr. Christian Barmen, a business-savvy native of Norway, co-founded Recharge Health in 2018 and has since gone on to build a compact team of multi-cultural personnel with expertise in fields as diverse as engineering, biotechnology, and medicine. The company was established with the clear aim of adapting the well-documented health benefits of red light, an innovative technology which has been used by NASA to help astronauts heal faster. Although red light's development costs have previously placed it beyond the reach of mass markets, Recharge Health has developed the technology to create FlexBeam, a powerful and targeted wearable device that is available at an affordable price.

Launched by Recharge Health in March 2020 after two years of product development, testing and processing with the Food and Drug Administration (FDA), FlexBeam is a multi-functional wearable device that utilizes LEDs to beam red light and near infrared light in the form of targeted red light therapy. With red light therapy now recognized by scientists for its efficacy in stimulating cells to speed up the healing process, FlexBeam offers a more affordable and at-home version of the recovery device.

Since March 2020, Recharge has been crowdfunding FlexBeam on Indiegogo, an international platform that enables early backers to order products from innovators before they become mainstream. Through this channel, Recharge Health has already secured orders



from technology enthusiasts, mostly in the US. Having also received investment incentives from the BOI in 2020, Recharge Health is currently looking to develop new devices that use red-light therapy and further tap into the potential of the technology. The company guarantees that every item will be produced and shipped from Thailand. Mr. Barmen shares with us his views on running a medical device startup from Chiang Mai.

What are targets of your operations in Thailand?

We develop products using photobiomodulation (PMB) therapy which is essentially a method of using light at specific wavelengths to stimulate the human body cells to speed up the self-healing process which, as cited by scientific research worldwide, can be used to relieve pain and help the body to boost overall performance.

All the manufacturing process takes place at our facility in Hang Dong, while our main market is currently the US. We invent and make everything in-house as an ISO-certified medical device company with an advanced technology lab, manufacturing assembly facility and on-site clinic. At present, we ship our products worldwide one by one.

We get the best of both worlds by developing the products at a relatively controlled cost level and with good access to the world market. Red light therapy technology has long been used by athletes and astronauts and has recently been increasingly used as a panel in many places, but the price was prohibitive until now.

A full body infrared bed can cost \$150,000. But with the recent advances in LED technology, prices have been dropping rapidly. We hope that one day these devices will be available in every household. And this is what we are excited about.

We are making wearable health-tech devices in the borderline between medical devices and consumer goods for buyers to order online.

What advantages does Thailand give to your operation?

I guess twenty years ago, China was a place where multinational producers were looking to invest, but the cost effectiveness in China has begun to erode. Thailand gives a benefit in terms of cost control and has the fundamental factors that attract many companies to diversify to the country as another base for both product development and manufacturing.

For us, Thailand was a natural selection because of the temperature, education level of the workforce, overall safety, quality of infrastructure, culture and the people. With the BOI's support, we are able to hire people and experts from all over the world. We have about 29 people in Hang Dong now with

<https://recharge.health>



about 15 different languages. In Norway, it would have been very difficult to attract so many foreign experts to come. Thailand offers the benefit of a lower cost of living, but with that level of salary expectation, our people and their family can have an amazing life. In terms of online services, the country has an efficient internet infrastructure and systems for work permits and tax.

In terms of production, Thailand is a brilliant place for our operations. We are close to where all the electronic pieces are being made and materials such as plastic and silicone are being produced. We don't have to fly out of the country to visit suppliers. Even up here in the northern region, we can find qualified local suppliers to work

with. Some of them are local and have received the BOI's promotions.

How well does Thailand's ecosystem support your business?

For a company like Recharge Health, we are looking at education, as we need highly skilled and qualified engineers. Thailand has recently been a base for a lot of manufacturing by many multinational companies such as those from Japan and Germany, and Thailand has greatly benefited from knowledge transfers. We are seeing more and more qualified people from the younger generations joining our workforce and completing internships. Overall, the quality of general knowledge for Thai engineers is relatively very high compared to other ASEAN

countries. At first, people might think of Chiang Mai as a destination for their holidays and retirement, but there are actually many talents out there.

As mentioned earlier, we also benefit from the fact that Thailand is the place where people from many countries want to come and work. It's normally easy to attract talents here. Even during the pandemic, we have people moving from Europe to work for us. Apart from the fantastic living facilities, Thailand also has many options of high-quality international schools for children's education.

We are now looking at the next step of challenges of raising funds with investors. As we want our company to remain a Thai company, our priority is a partnership with Thai investors. ■

THAI ECONOMY At A Glance

Key Economic Figures



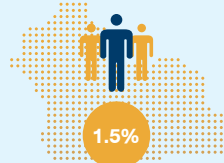
GDP Growth



Note: *Estimated value | Source: NESDC (Data as of March 2021)

Unemployment

Dec 2020*



Headline Inflation

Average 2020*



Source: National Statistical Office, Ministry of Commerce

Investment Growth

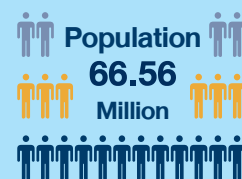


Export Value of Goods Growth



Note: *Estimated value | Source: NESDC

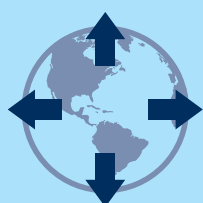
Market Profile (2019)



Minimum Wage
THB 313 - 336

US\$ Approximate
US\$ 9.98-10.71

Source: Ministry of Labour



Export Figures

Export value (USD million)

Jan - Dec 2019 : 246,268.8

Jan - Dec 2020 : 231,468.4

Jan - April 2021 : 81,413

Source: Ministry of Commerce

Top 10 Export Markets (January - March 2021)

Rank	Value (US\$ million)	Share
United States	12,146	15%
China	10,730	13%
Japan	7,940	10%
Vietnam	4,104	5%
Malaysia	3,690	4.5%
Australia	3,503	4.3%
Hong Kong	2,570	3.1%
Indonesia	2,570	3.1%
India	2,530	3.1%
Singapore	2,299	2.8%

International Competitiveness

Global Competitiveness

2018 : 38th | 2019 : 40th

Source: World Economic Forum

World Digital Competitiveness

2019 : 40th | 2020 : 39th

Source: IMD

Ease of Doing Business

2019 : 27th | 2020 : 21st

Source: World Bank

Top 10 Exports

Goods / Products	Value (US\$ million)	Share
1. Vehicles and Parts	9,518	11.69%
2. Computers and Parts	6,325	7.77%
3. Rubber Products	4,894	6.01%
4. Plastic Pellets	3,291	4.04%
5. Chemical Products	2,696	3.31%
6. Integrated Circuits	2,468	3.03%
7. Machinery and Parts	2,432	2.99%
8. Air Conditioners and Parts	2,410	2.96%
9. Jewelry Products	2,340	2.87%
10. Refined Fuel	2,231	2.74%

Source: Ministry of Commerce

Exchange Rates (As of 25 May 2021)



Source: Bank of Thailand

Tax Rate

Corporate Income Tax: 0 - 20%
Personal Income Tax: 5 - 35%
VAT: 7%
Withholding Tax: 1 - 15%

Source: the Revenue Department (As of May 2021)

ABOUT BOI

The Office of the Board of Investment (BOI) is the principle government agency that operates under the Prime Minister's Office for the purpose of encouraging investment in Thailand. We at the BOI serve as the professional contact points for investors, providing them with useful investment information and services. We offer business support and investment incentive to foreign investors in Thailand, including tax and non-tax incentives. A few non-tax incentives include granting land ownership to foreigners and facilitating visas and work permits. Besides serving the needs of overseas investors, we also offer consultation services to Thai investors who are interested in investment opportunities abroad.



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BOI Marketing

