POLICY INSIGHT

Building the "Suprastructure"

Elevating Philippine Innovation through Science and Technology Human Capital Development

GISELA CONCEPCION

The Philippines faces significant national challenges, including poverty, hunger, malnutrition, and their detrimental effects on human development, which are largely attributed to marginal agricultural productivity and food insecurity exacerbated by climate change. This persistent cycle has hindered the development of high-value commercial products from agriculture and natural resources, leading to stagnation in the manufacturing sector and limiting job creation and poverty alleviation, particularly for farmers and fisherfolk, who remain among the poorest communities. A primary reason for these enduring problems is the historical lack of investment in S&T-based knowledge, R&D, innovation, and governance, causing the Philippines to lag considerably behind its ASEAN neighbors in scientific and technological capabilities over the past half-century.

Recognizing that sustained technological development and economic progress, as well as an improved quality of life, are critically dependent on S&T human capital development, the proposal highlights that all technologically advanced nations prioritize investing in the advanced education and training of their brightest youth. Data from international organizations like WIPO, UNESCO, and the World Bank consistently show a strong positive correlation between gross expenditure on higher education (GEHE), gross expenditure on R&D (GERD), and national economic prosperity, global competitiveness, and innovation rankings.

Drawing inspiration from successful models in Asian countries such as Japan, South Korea, China, Taiwan, India, Pakistan, Singapore, Thailand, Malaysia, Indonesia, and Vietnam, which have heavily invested in S&T human capital by sending thousands of students abroad for advanced studies, the proposal aims to bridge the gap between S&T knowledge creation and its utilization for commercialization and economic prosperity in the Philippines. Models like Germany's Fraunhofer system, with its strong public-private partnerships and direct links between research and industry, and Taiwan's universities with integrated innovation hubs and industrial parks, offer blueprints for fostering entrepreneurial growth and ensuring that public expenditure in R&D yields significant returns in GDP. The proposal acknowledges past Philippine programs that failed to make a lasting impact due to a lack of massive, sustained investment in postgraduate studies abroad and issues with scholars returning home. The goal is to learn from these experiences and from foreign models, including the success of Small Business Innovation Research (SBIR) grants in the U.S. and Singapore's investment in MIT's SMART program, which led to the establishment of the Singapore University of Technology and Design (SUTD), to create a robust and sustainable innovation ecosystem in the Philippines. This includes adopting new intellectual property (IP) regimes that incentivize commercialization and generate revenue for research institutions, demonstrating a direct link between R&D, innovation, and economic growth.

Powering Progress: Investing in Research and Innovation

At the heart of the NIASD are clear, aggressive targets designed to rapidly scale up the Philippines' innovation capabilities:

- **Growing Our Research Talent:** The country aims to dramatically increase its pool of researchers. From a modest 174 full-time equivalent (FTE) researchers per million people in 2022, the goal is to reach 500 by 2028 and an impressive 1,500 by 2032. This significant boost is crucial for the Philippines to close the gap with regional peers like Thailand, which boasts approximately 1,790 researchers per million people, and Vietnam, with about 757.

- **Boosting R&D Spending:** The Philippines is committed to a substantial increase in its national spending on research and development (R&D). In 2022, only 0.3% of the nation's Gross Domestic Product (GDP) was allocated to R&D. The NIASD targets an increase to 1% of GDP by 2028 and 1.6% by 2032. Given that the Philippines' GDP was approximately $400 billion US Dollars (USD) in 2022, achieving the 1% target by 2028 alone translates to an additional $2.8 billion USD poured into R&D. This substantial financial commitment is viewed as the fundamental "suprastructure" – the essential human and knowledge capital – required to ignite and sustain high-level innovation for the long term.

Bridging the Gap: Cultivating Expertise and Commercializing Ideas

Despite a good number of college graduates, the Philippines faces a critical challenge: slow graduation rates for Master's and PhD degrees in Science, Technology, Engineering, and Mathematics (STEM) fields. This results in low research output and minimal success in transforming academic discoveries into marketable products. Unlike many advanced economies where universities are vibrant centers of innovation that fuel industrial growth, the Philippines needs to forge stronger links between its academic institutions and industries.

To address this, the NIASD proposes a two-pronged strategy:

- **Global Education for Local Impact:** A major program will send the country's brightest young minds to leading universities and research centers worldwide, primarily in the United States, for advanced Master's and PhD studies. These scholarships are not for individuals alone; they are strategically planned for groups of students to specialize in complementary disciplines critical to the Philippines' priority industries. Scholarship packages will be highly attractive, offering incentives and assured employment upon their return to universities, research institutes, or private industries in their home regions. Reintegration will be a collaborative effort, secured through partnerships with foreign mentors, the Department of Foreign Affairs (DFA), and inter-governmental agreements on science and technology education.

- **Establishing the Philippine Advanced Technology Innovation Institute for Industry (PATIII):** This new, independent institute will be a cornerstone of the innovation ecosystem. As an attached unit of the National Economic and Development Authority (NEDA) and the Department of Trade and Industry (DTI), PATIII will be strategically located in a Philippine Economic Zone Authority (PEZA) zone. This location will streamline administrative processes, including procurement and hiring, and allow for internationally competitive salaries and incentives, making it attractive to top talent.

PATIII will feature state-of-the-art R&D facilities and will focus on high-level, industry-driven research to serve both Micro, Small, and Medium Enterprises (MSMEs) and large industries. A key innovation will be a new intellectual property (IP) regime allowing for the outright sale of IP to industries, rather than relying solely on royalties. This approach, inspired by successful models in Australia and the U.S., aims to generate significant revenue for PATIII, thereby creating a sustainable cycle of innovation and commercialization. PATIII will actively recruit world-renowned Filipino expatriate scientists and engineers with innovation management expertise to lead the institute and attract entire world-class research teams (not just individuals) to join. It will also foster strong links with universities by offering joint Master's and PhD degree programs with an industry-focused thesis, provide postdoctoral opportunities for young faculty, help establish innovation hubs, and manage Small Business Innovation Research (SBIR) grants to universities, serving as a vital link to industries.

Strategic Innovation for National Prosperity

The Philippines' innovation efforts will be concentrated on three vital and interconnected priority areas, all while prioritizing environmental sustainability and leveraging digital and Artificial Intelligence (AI) technologies:

- **Agriculture and Fisheries Technologies:** Crucial for enhancing food productivity and ensuring national food security. This focus directly impacts poverty alleviation by improving livelihoods in marginalized farming and fishing communities, thereby increasing the GDP per capita in these sectors.

- **Renewables and Nuclear Energy Technologies:** Essential for securing clean, cheap, and continuous energy. This aligns with addressing the adverse impacts of climate change and ensures a stable energy supply for industrial growth.

- **Metallurgical and Materials Technologies:** This area focuses on developing new materials for metal industries (like stainless steel, iron, and other metals), for energy storage/batteries, semiconductors ("green metals"), and for chemical and health industries (petrochemicals and organic chemicals). This leverages the Philippines' natural resources to produce high value-added products, making them attractive to export-oriented industries and enhancing the country's manufacturing sector.

Bridging the Academia-Industry Divide and Fostering Commercialization

The document acknowledges the current disconnect between academic research and its practical application in Philippine industries. The proposed PATIII is designed to directly address this by:

- **Industry-Focused Research:** The institute will undertake contract research and provide consulting services to both Micro, Small, and Medium Enterprises (MSMEs) and large industries, as well as government agencies, including Local Government Units (LGUs). This will ensure that research directly addresses industry needs and problems.

- **New Intellectual Property (IP) Regime:** The PATIII will implement a system where intellectual property developed at the institute can be outright sold to industries, rather than relying on royalty payments. This model, inspired by successful practices in Australian universities and United States research laboratories, is designed to incentivize commercialization and generate substantial revenue for the PATIII, creating a self-sustaining innovation ecosystem.

- **Direct Linkages with Academia:** The PATIII will partner with leading universities to offer joint Master's and PhD degree programs and postdoctoral fellowships. These programs will focus on industry-

relevant thesis and dissertation research, ensuring that postgraduate students contribute directly to solving real-world industrial problems. The PATIII will also help establish innovation hubs and provide Small Business Innovation Research (SBIR) grants to universities, mirroring successful programs in the United States.

A Holistic Vision for a Developed Philippines

This comprehensive innovation strategy is designed to achieve more than just economic growth; it is a holistic approach to national development that seeks to directly address the Philippines' most pressing challenges:

- **Alleviating Poverty and Improving Quality of Life:** By creating more jobs and livelihoods, particularly in the agricultural and fisheries sectors, the goal is to significantly increase the GDP per capita of the poorest communities. This aims to combat hunger, malnutrition, and the resulting physical stunting and mental disabilities, ultimately enabling Filipinos to achieve a "matatag, maginhawa at panatag na buhay" – a stable, comfortable, and secure life.

- **Enhancing Global Competitiveness:** The strategy aims to transform the Philippines from a raw material exporter to a producer of high-value, competitive commercial products. This will revitalize the manufacturing industry, provide massive jobs, and reduce trade deficits.

- **Promoting Environmental Sustainability:** The plan integrates waste reduction, recycling, and increased use of renewable energy to achieve net-zero carbon emissions. This includes establishing agricultural biotechnology and industrial parks that serve as models for environmentally sustainable corporate farming and fisheries, contributing to a circular social economy.

- **Fostering Social Innovation:** New paradigms of social innovation will be pursued, focusing on empowering regional communities through technology-driven training for people-centered governance. This includes linking large industries with local supply chains involving MSMEs and cooperatives, and connecting them to local and foreign markets through digital and material connectivity. The strategy also

promotes a nationwide niche-based creative ecotourism industry, utilizing technology to preserve culture and nature and create high-standard international ecotourism destinations.

This ambitious agenda, drawing inspiration from successful models in Germany (Fraunhofer), Taiwan, Japan (RIKEN), South Korea (KAIST), and the United States (SBIR grants), represents a definitive, massive investment in Science and Technology (S&T) human capital development. It underscores the conviction that this "suprastructure"—the advanced education and training of its brightest youth—is the singular, most critical investment for driving and sustaining innovation-based competitiveness and overall societal progress for the Philippines.