

# FILIPINNOVATION: FINANCING SCIENCE FOR THE PEOPLE

**Fortunato de la Peña**, Department of Science and Technology, Philippines

The Philippines has long experienced regional disparity in access to major resources that could potentially fuel innovation and socioeconomic growth within the country. Further widening this gap is the country's archipelagic topography of over 7,641 islands coupled with its long history of related postcolonial challenges. Added to the mix are the low telecommunications bandwidth and insufficient public infrastructure to establish and sustain synergistic connections.

This regional disparity in access to resources also extends to financing innovation because most research and development (R&D) funding is concentrated in the capital of Manila and its neighboring regions. This lack of regionally-inclusive funding for R&D poses negative effects on the country's social and economic development.

However, these regional differences, if synergized through efficient transport and communication infrastructure, can be transformed into an opportunity to stimulate creativity and innovation.<sup>1</sup> With local communities having unique challenges of their own, it is necessary to generate niche-adapted solutions that capitalize on local knowledge and resources. In addition, each region's challenges—and even their advantages—can serve as lessons that other regions may learn from and possibly apply to their own problems.

One of the core values of the Filipino culture is *Bayanihan*, which is the community spirit to lighten any work through cooperation and collaboration.<sup>2</sup> Leveraging on *Bayanihan* in the context of technology and innovation, key government agencies such as the Department of Science and Technology (DOST), the Department of Trade and Industry (DTI), and the National Economic Development Authority (NEDA), together with representatives from academia, industry, and civil society

organizations, crafted the Philippine National Innovation Strategy and called it *Filipinnovation*—a whole-of-government approach to inclusive innovation.

In this chapter, we describe the challenges that the Philippines has faced in pursuing regionally-inclusive innovation and the collaborative efforts to address them.

## Funding grassroots innovation

Based on the United Nations Educational Scientific and Cultural Organization (UNESCO) benchmark, a developing country should at least have one percent (1%) Gross Domestic Product (GDP) Expenditure on R&D (GERD). Over the years, the GERD of the Philippines has remained below one percent, but the country has remained resolute in accelerating innovation despite prevailing budgetary limitations.

While the total R&D funding of government has dramatically increased by a factor of seven in the last eight years, the economic growth of the country has increased faster. Thus GERD remained unchanged—the Philippines remains in the bottom third of the 2019 Global Innovation Index (GII) in terms of GERD.

In 2014, about 93% of DOST R&D funding was concentrated in regions near Metro Manila, and only 7% was distributed among the other 14 regions of the country.<sup>3</sup> Moreover, out of 2,000 Higher Education Institutions (HEIs), only 74 had partnerships with publicly funded R&D. The country also has limited science, technology, and innovation (STI) infrastructure such as laboratories, testing facilities, and R&D centers. Those that exist need upgrading to undertake research, development, and

innovation activities. Likewise, industry-academia collaborations for R&D are rare, despite the incentives offered by the government. The inability of most universities to be involved in R&D stems from the lack of enabling policies, opportunities, research leaders, and funding. This is evidenced by the roster of proponents for government-funded R&D programs and projects, which remains largely unchanged across each cycle of the call for proposals.

Recognizing the relevance of grassroots innovation solutions, in 2016, the DOST initiated the Science for Change Program (S4CP) that articulates a strategy to finance regionally-inclusive innovation in the country. It aims to accelerate the development and adoption of STIs by proportionately spreading funding across all regions for capacity-building initiatives and securing partnerships across academia and industry members. The S4CP is composed of four components, namely: 1) Niche Centers in the Regions for R&D (NICER) Program, 2) R&D Leadership (RDLead) Program, 3) Collaborative R&D to Leverage Philippine Economy (CRADLE) Program, and 4) Business Innovation through S&T (BIST) for Industry Program (Figure 8.1). These are expected to stimulate growth and innovation in all regions of the country.

### **Niche Centers in the Regions for R&D (NICER) Program**

The NICER Program capacitates HEIs in the regions to make significant improvements in regional research by integrating development needs into existing R&D research capabilities and resources. The DOST, through the NICER Program, provides institutional grants for HEIs to undertake quality research that will catalyze and promote regional development.

As of 2019, the NICER Program has established 18 R&D centers spread out across 14 of the 17 regions with total funding of US\$12 million (Figure 8.2). The R&D grants were provided to state and private universities, not only for upgrading facilities and human resource development but also for regional economic development. NICERs cover niche areas and abundant commodities, such as potato at Benguet State University (Northern Philippines), crustaceans at Samar State University (Central Philippines), and renewable energy at Ateneo de Davao University (Southern Philippines).

The potato R&D center was established at Benguet State University since 84% of national production of potato is produced in this region. It is a multimillion dollar industry that significantly contributes to the Philippine economy. The center will enhance the potato production system in the region and increase the income of farmers.

Eastern Visayas is one of the poorest regions of the Philippines. It houses the province of Samar where the crustaceans R&D center is located. Crustaceans, such as crabs, are the main source of income of fisherfolk in the area. However, the region has encountered an alarming decline of these resources in recent years. Hence the center aims to develop strategies and policies to enhance productivity and sustainable utilization of commercially valuable crustaceans.

The renewable energy R&D center was established in Mindanao, as the region has been suffering from frequent power shortages. Some villages do not have electricity from the power grid due to the vast land area of Mindanao.

### **R&D Leadership (RDLead) Program**

R&D centers, institutes, and other national government agencies (NGAs) in the Philippines vary in their capacity to pursue innovative research and development activities, due primarily to lack of facilities and inaccessibility of experts to train, direct, and support R&D goals; most experts are affiliated with established academic institutions in Metro Manila. In the 2019 Global Competitiveness Report, the Philippines ranked 72nd in terms of quality of scientific research institutions and 55th in terms of scientific publications, out of 141 countries.<sup>4</sup> DOST, through the R&D Leadership Program, engages local experts to lead and strengthen the research capabilities of academic institutions, R&D centers, and NGAs located in any part of the country.

The establishment of niche research centers for seaweed, halal goat, and sea cucumber are just three successes from universities in the Philippines that engaged RDLeaders through the program. These universities are located in Tawi-Tawi, Sultan Kudarat, and Misamis Oriental, respectively. All three are based in Mindanao in the southern part of the Philippines—farthest from the country's capital of business and home to some of the poorest municipalities in the country.

The RDLeaders serve as catalysts who bring out the latent talent of the universities and researchers in the province, which will lead to innovation and sustainable economic growth where they are assigned.

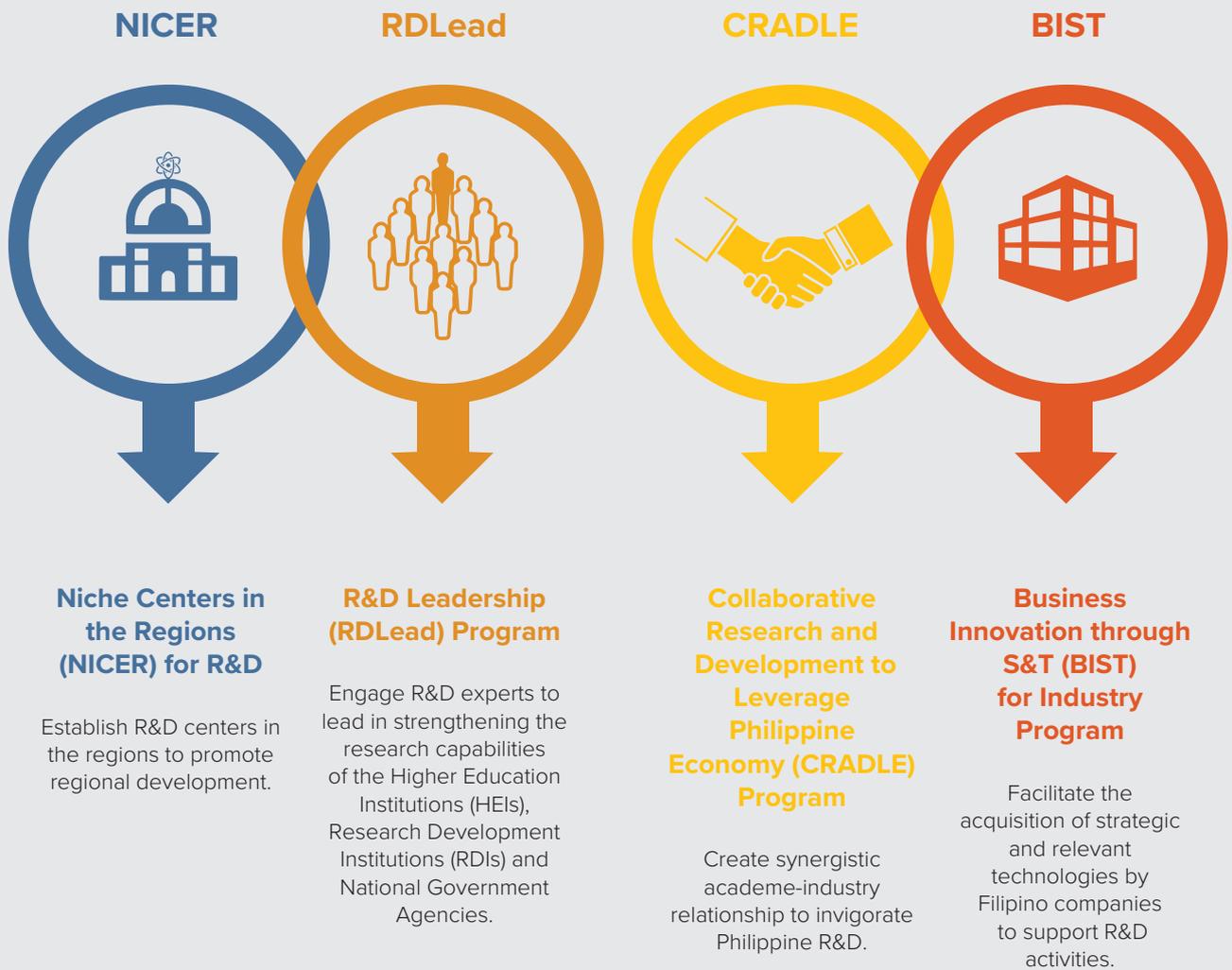
### **Collaborative R&D to Leverage Philippine Economy (CRADLE) Program**

In the past, researchers in HEIs in the Philippines conducted R&D expecting that their outputs would be adopted by industries. However, it turned out that most R&D outputs were not tailored to fit the specific needs of industry. As a result, the majority of R&D outputs only ended up being presented in conferences, published in reports or journals, or granted utility models (UMs) for display rather than commercialization. In most cases, R&D investments were not cost-effective and did not benefit the intended user. To reverse the situation, the DOST initiated the CRADLE Program that aims to shift the academic and research practice from being publication-centric to being industry-driven, thereby maximizing its socioeconomic impacts.

In addition, most large companies in the Philippines are not open to collaborating with research institutions, and some rely on in-house R&D units. However, under the CRADLE Program, academia and industry have started to collaborate, and their reception to the program has exceeded expectations. The feedback on the successes of academia-industry collaborations is very promising, particularly in a partnership started in 2017 between Hijo Resources Corporation (HRC), a 677-hectare banana plantation based in Mindanao, and the University of Southeastern Philippines (USEP).

FIGURE 8.1

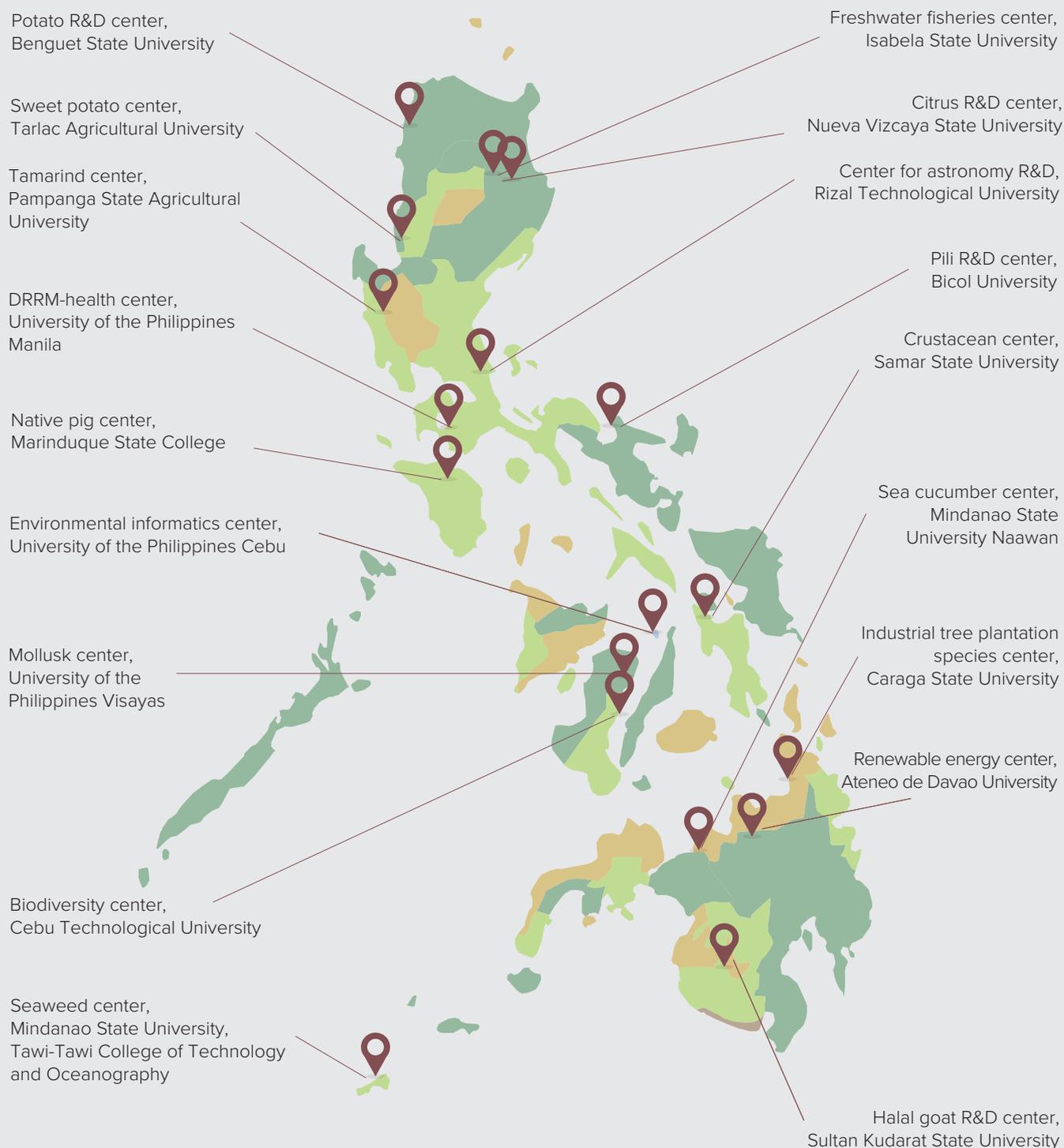
## The four components of the DOST Science for Change Program



Source: Philippine Department of Science and Technology (DOST), 2020.

FIGURE 8.2

## DOST R&D centers with corresponding universities across the Philippine archipelago



Source: Philippine Department of Science and Technology (DOST), 2020.

Before the project, HRC needed to frequently spray pesticides on the entire plantation, costing millions of pesos each year. Recognizing the expertise of the university, HRC collaborated with USEP and successfully developed an innovative surveillance system that will map the spread of banana diseases in the plantation. The system has reduced pesticide spraying without affecting the fruit quality, resulting in significant savings for HRC.

To date, HRC has adopted the technology and continues to collaborate with USEP to fine-tune it using HRC funds. Furthermore, HRC formalized USEP as their “research arm” through a Memorandum of Agreement that resulted in the establishment of an R&D center for banana disease control located at USEP and financed by HRC.

The partnership of HRC and USEP paved the way for collaboration opportunities with other private companies located in the area. To date, USEP has 18 research engagements worth US\$1.5 million—roughly a third of which were funded by private companies.

A government investment of US\$100,000 in the HRC-USEP CRADLE project led to more private companies trusting and investing in research and development done in partnership with HEIs. The HEIs, on the other hand, have learned to conduct industry-driven research.

### **Business Innovation through S&T (BIST) for Industry Program**

DOST is pursuing an initiative to level-up the innovation capacity of Filipino-owned companies while promoting R&D-based industry. In November 2019, financial assistance amounting to US\$200,000 was given to the first private company under the Business Innovation through S&T (Science and Technology) for Industry Program. The company, based in the Western Visayas region of the Philippines, will use the financial assistance to acquire technology to semi-purify herbal extracts to develop pharmaceutical-grade ingredients. The BIST Program is designed to assist Filipino-owned companies to innovate and develop competitiveness through the acquisition of new and relevant technologies for research. The proposed technology acquisition and corresponding research run for three to five years, with a refund to the government at zero interest commencing on the third year of project implementation.

Within three years of implementing the S4CP, there have been increases in the pool of researchers, the scale of research in almost all regions, the accessibility of research facilities, and industry-academia research collaborations. Specifically, the program has almost doubled the number of HEIs engaged in R&D from 74 in 2014 to 149 in 2019. R&D funding to regions beyond Metro Manila has increased from 7% in 2014 to 20% in 2019. The Philippines’ ranking in university/industry research collaboration also rose from 56th in the GII in 2018 to 25th in 2019. With the dramatic increase in research outputs from HEIs all over the country, DOST has established over 30 additional technology business incubators to accelerate technology transfer from academia.

## **Innovating to solve pressing problems**

Coconut is considered to be the tree of life—all parts have economic value from coconut sugar, virgin coconut oil, vinegar, and wine, to activated carbon and nanocrystals. From 2009 to 2013, the Philippine coconut industry suffered significant economic losses due to an outbreak of coconut scale insect (CSI) affecting approximately 1.2 million trees. There are 3.5 million coconut farmers, and they are among the poorest in the country. To address the urgent crisis of producing quality planting materials to accelerate the replacement of CSI-infested trees, the development of the coconut somatic embryogenesis technology (CSet) was started in 2014. CSet is a technique for rapid, mass propagation of superior genetic stocks for high yielding, pest- and disease-resistant coconut. After five years of exhaustive R&D involving seven different Research and Development Institutes (RDIs), production of over 200 coconut plantlets per seednut is now possible; this is an enormous improvement over the traditional production of one single plantlet per seednut. The advancement in propagation of coconut will ensure that the materials are enough for massive planting and re-planting in the country. This collaboration proved that R&D and innovation can solve pressing national problems.

## **Filipinnovation**

Before 2007, the Philippines struggled to develop a system for innovation. The old linear model of innovation states that any technology generated will eventually be commercialized when it becomes fully developed and infused with generous financial capital. Ideally, any publicly funded R&D activity should generate new knowledge to advance current understanding in a particular field. The major challenge for R&D institutions and public incubators in the country is how to transfer and commercialize the new knowledge in fulfillment of the government’s role as the main facilitator of technology and knowledge diffusion. This implies, however, that any drive to diffuse developed technologies is limited by the availability and extent of investment.

There have been many instances where Filipino researchers avoid the process of commercialization due to lack of policies that will protect their intellectual property rights (IPR). Due to unfamiliarity or lack of proper financial means to engage in such activities, the output of some researchers has never reached commercialization.

To address this concern, Republic Act (RA) 10055 or the “Philippine Technology Transfer Act of 2009” was enacted. The law aims to promote and facilitate the transfer, dissemination, and effective use, management, and commercialization of intellectual property, technology, and knowledge resulting from R&D that was funded by the government for the benefit of the national economy and taxpayers. The Technology Transfer Act of 2009 endeavored to create an attractive and financially rewarding environment for RDIs and scientists by providing

them the IPR for output arising from government-funded research, which in turn encourages them to commercialize the technologies produced from their research.

However, the enactment of RA 10055 did not accelerate technology transfer as expected. There were two missing ingredients—enabling policies and funding.

In 2015, DOST released its intellectual property (IP) policy followed by policies on data sharing, IP management, and technology transfer protocols; guidelines for the fairness opinion board; and the provision of a revolving fund for implementing rules and regulations of the Philippine Technology Transfer Act of 2009. The weight of these policies was clear and apparent in the succeeding years as the Philippines' IP products expenditure as a percentage of GDP steadily increased from 1.0% in 2016 to 1.2% in 2017 and 1.4% in 2018. In 2018, the country's targets for IP were met as there were 466 national patent applications and 2 international applications under the Patent Cooperation Treaty (PCT), 2,069 utility models, and 875 industrial designs (IDs), all filed by Filipinos.

In the past, there have been cases where national government agencies were not coordinated or familiar with each other's programs. It is possible that an agency may not even be aware that other agencies have the same concerns; each agency acts without regard to the involvement of others, which duplicates effort and resources used. Complex problems stemming from these information asymmetries thus call for the expertise and resources of different agencies to come together—inclusive innovation being a case in point.

Filipinnovation provides a framework for collaboration among government agencies, academic institutions, industry, and civil society organizations. The interaction of these stakeholders has created and transferred knowledge that has enabled new products and business models to catalyze economic transformation and development. It has also enabled the integration of more stakeholders in the Philippine innovation and entrepreneurship ecosystem, such as local government units (LGUs); startups; micro, small and medium enterprises (MSMEs); R&D laboratories; S&T parks; incubators; fabrication laboratories (FabLabs); and investors.<sup>5</sup>

For example, the DTI and DOST have established regional inclusive innovation centers (RIICs)—with the assistance of the Science, Technology, Research and Innovation for Development (STRIDE) Project through the United States Agency for International Development (USAID)—and with support of regional agencies, chambers of commerce, HEIs, and other stakeholders. RIICs serve as venues for collaboration among government, education, and industry players to collectively pursue market-driven research. RIICs have been piloted in the Bicol, Central Visayas, Northern Mindanao, and Southern Mindanao regions.

The tandem of NICER and RIIC is an enabling mechanism built on knowledge developed through R&D. First, the NICER

Program supports universities—as technology generators and capacity builders in the locality who develop niche commodities and knowledge through R&D. Investments are being poured in to set up infrastructure to improve market competitiveness, production yield, and valorization of commodities as well as to strengthen the absorptive capacity of local producers. The RIIC then aids in the commercialization and mass adoption of innovative technologies through its accelerators, incubators, and innovation hubs. It capitalizes on the industry clusters in the regions and provides support for innovation and entrepreneurship.

In effect, the synergistic efforts of NICER and RIIC might provide growth and opportunities for innovation in all the regions of the archipelago by building on the region's unique characteristics and boosting the push for technology from the laboratory to the market.

Stakeholders in RIICs reported significant strides under the initiative. One of the success stories is the launch of the Optimizing Regional Opportunities for Business Excellence through Science, Technology, and Innovation (OROBEST) in Northern Mindanao. OROBEST seeks to enhance regional industry productivity and competitiveness through the adoption of scientifically developed technologies. Upon implementing OROBEST, an industry needs assessment was conducted, and relevant local research outputs were identified.

This is also similar to the Negosyo Center Program, a banner program of the DTI responsible for promoting ease of doing business and facilitating access to services for MSMEs. Negosyo Centers are business centers that stimulate entrepreneurship development for MSMEs, which contribute substantially to driving the Philippine economy. They are found in strategic areas convenient for existing and would-be entrepreneurs, such as DTI offices, LGUs, academic institutions, non-government organizations (NGOs), and malls.

For technology upgrades, the DOST provides funds through the Small Enterprise Technology Upgrading Program (SETUP). SETUP is a nationwide program aimed at encouraging MSMEs to adopt technology innovations to improve their operations, which will result in increased productivity and competitiveness. In 2019, a total of 784 MSMEs received funding support, and these firms have generated 13,358 jobs. Funding for SETUP has expanded with the collaboration between DOST and the Development Bank of the Philippines, which offers very low interest rates for technology acquisition under the program. In a similar manner, DOST and the Landbank of the Philippines co-fund inventors. All these programs are implemented with the goal of solidifying the country's efforts to accelerate regional innovation across the Philippines (Table 8.1).

In addition, collaboration among these actors also resulted in the development of policies, particularly the Philippine Innovation Act and the Innovative Startup Act, that attempt to create an enabling environment to accelerate STI in the country.

TABLE 8.1

## Summary of DOST innovation funding mechanisms, 2017–2019

Program	Budget 2017–2019, US\$
Niche Centers in the Regions for R&D (NICER)	6,200,000
Collaborative R&D to Leverage Philippine Economy (CRADLE)	1,200,000
R&D Leadership (RDLead)	600,000
Business Innovation through S&T (BIST) for Industry	200,000
Small Enterprise Technology Upgrading Program (SETUP)	54,000,000
Other Grants-in-Aid Programs (DOST-GIA)	151,000,000
<b>Total</b>	<b>213,200,000</b>

Source: Philippine Department of Science and Technology (DOST), 2020.

Note: Figures are converted from Philippine pesos to US\$ and rounded to the nearest hundred thousand.

### Philippine Innovation Act

Recognizing that R&D and appropriating funds for it are essential for national development, the Philippine Congress pushed for the approval of the Philippine Innovation Act. The law gives priority “to generate and scale up actions in all levels and areas of education, training, research, and development towards promoting innovation and internationalization activities of micro, small and medium enterprises as drivers of sustainable and inclusive growth.”

One of the goals of the law is to implement an action plan for the development of the country’s capacity for and success in innovation, as measured by the GII and other similar indices.<sup>6</sup> Through the Philippine Innovation Act, the following hurdles in the STI sector will be addressed:

- weak STI culture,
- absence of a vibrant intellectual property culture,
- slow commercialization of STI outputs,
- lack of awareness of R&D activities,
- low government spending on R&D,
- difficulty in increasing employment opportunities,
- retention of S&T human capital,
- inadequate STI infrastructure, and
- lack of collaboration among players in the STI ecosystem.

For instance, the Department of Foreign Affairs (DFA) will facilitate the participation of qualified members of the Filipino *diaspora* in the country’s innovation drive. The Filipino diaspora consists of 10 million overseas Filipino workers. The DOST will lead in mobilizing Filipino talents for innovation and S&T efforts, and the Intellectual Property Office of the Philippines (IPOP HL) will promote the registration of patents, trademark,

copyrights, and industrial designs among scientists, inventors, and innovators to ensure the protection of innovation against misappropriation.

### Innovative Startup Act

In pursuit of innovation that propels economic growth, the Philippines enacted the Innovative Startup Act (ISA). It is a joint initiative of three national government agencies, namely the DOST, DTI, and Department of Information and Communications Technology (DICT). Through the law, the state shall provide incentives to new businesses to engage in innovative entrepreneurial activities.

The ISA shall provide incentives and remove constraints aimed at encouraging the establishment and operation of innovative new businesses that are crucial to growth and expansion. The act will also strengthen, promote, and develop an ecosystem of business and government and non-government institutions that foster an innovative entrepreneurial culture in the Philippines.

Some of the incentives supported by the law include: 1) full or partial subsidy on business registration, 2) endorsement to IPOP HL, 3) full or partial subsidy on the use of facilities, office space, and equipment/services provided by government or private enterprises/institutions, and 4) grants for research, development, training, and expansion projects.

To strengthen the innovation ecosystem in the country, this whole-of-government approach is indispensable.

With its implementation, Filipinnovation has harnessed the potential of more Filipino innovators and entrepreneurs, which can lead the country to a more competitive standing in the global economic arena, at par with leading innovation achievers.

## Filipinnovation: whole-of-government approach to inclusive innovation

Filipinnovation is the whole-of-government approach (WGA) to inclusive innovation, which will ensure policy coherence, alignment of priorities, and effective coordination in service delivery. This approach recognizes the importance of an inclusive innovation ecosystem that delivers coordinated action in various areas.

Given the range of government agencies that have a hand in Filipinnovation and in funding grassroots innovation, the need to integrate policies and programs to propel innovation initiatives in the country should follow a whole-of-government approach. This has been proven effective when the country entered the circle of innovation achievers reflected in its 2019 GII ranking. Through Filipinnovation, silos are eliminated as government agencies no longer work in isolation. In this approach, the country avoids having different policies cut across and undermine each other. The Filipinnovation strategy optimizes the impact of government funding towards inclusive innovation and ensures the multiplier effect of its impact and resources. Thus, even with low funding for R&D, innovation in the country has flourished as evidenced in the GII 2019, where the Philippines produced more innovation outputs relative to the level of its innovation investment. Financing innovation using the Filipinnovation strategy has expanded the Philippine innovation ecosystem, made the Science for Change Program possible, and has increased the Philippines' innovation efficiency.

The next challenge is to practically sustain Filipinnovation momentum and translate it into tangible problem-solving and lasting positive change—built on the collective power of Filipino minds and ideas working together from every island of the archipelago.

### Notes:

- 1 The Manila Times, 2015.
- 2 Bayanihan is the community spirit to lighten any work through cooperation and collaboration, usually associated with an image of a group of people who are physically moving a small house from one place to another.
- 3 Universities Funded under the Department of Science and Technology Grants-In-Aid Program (DOST-GIA) 2014-2019.
- 4 Global Competitiveness Report 2019.
- 5 Policy Advocacy Group (PCARRD), 2009.
- 6 Philippine Innovation Act, 2019.

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