2023-2032

NATIONAL INNOVATION AGENDA AND STRATEGY DOCUMENT



THE PHILIPPINE INNOVATION ACT

Republic Act No. 11293, otherwise known as the "Philippine Innovation Act," was signed by President Rodrigo R. Duterte on April 17, 2019. The law adopts innovation as a vital component of the national development and sustainable economic growth.

NATIONAL INNOVATION COUNCIL

The National Innovation Council (NIC) is composed of the President of the Philippines as the Chairperson, the Secretary of the National Economic and Development Authority as the Vice Chairperson, 16 officials as *ex-officio* Members, and the seven (7) Executive Members from the academe, business sector, MSMEs, and scientific community. The NIC is responsible for the development of the country's innovation goals, priorities, and long-term national strategy.

ABOUT THE COVER

The cover illustration is a picture of our aspirational 2032 vision for a Smart and Innovative Philippines, as outlined in the National Innovation Agenda and Strategy Document (NIASD). It seamlessly weaves together some iconic Filipino landmarks, with its ten icons representing key innovation priority areas identified by the National Innovation Council (NIC). This cover captures our future as a harmonious fusion of inclusivity, resilience, productivity, and sustainability, forging a path that's uniquely and innovatively, Filipino.

2023-2032

NATIONAL INNOVATION AGENDA AND STRATEGY DOCUMENT

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MESSAGE





In line with our shared vision to propel our nation to greater heights, the **National Economic and Development Authority** presents **National Innovation Agenda and Strategy Document 2023-2032,** which aims to establish a more dynamic innovation ecosystem across all our sectors. With this goal in mind, we endeavor to champion research and development, promote our local entrepreneurs, and adopt our very own technologies.

This publication serves as a testament to the government's staunch commitment to increase the competitiveness of our industries and accelerate our economic growth. I hope that it will motivate all

stakeholders to align their organizational objectives with our national priorities and implement the strategies indicated in the NIASD 2023-2032 in all their endeavors. Most importantly, may it drive them to support our key players, particularly our scientists and researchers, among others, so that we can create a more agile workforce.

Aside from unleashing our country's utmost potential, let us remember that the core of this strategy is the well-being of our citizenry. Thus, continue to optimize our people's innate talents, skills, and ingenuity to find novel solutions that will empower our communities and address lingering issues. After all, it is only through our steadfast efforts that we can embark on a new era of progress and prosperity for our beloved Philippines.

Congratulations and I wish you meaningful years ahead.

FERDINAND R. MARCOS JR. President of the Republic of the Philippines

MANILA 27 September 2023

PREFACE



The collective, long-term aspirations of the Filipino people are articulated in the *AmBisyon Natin* 2040, the vision of a *matatag, maginhawa, at panatag* na buhay para sa lahat. By 2040, we hope to see Filipinos and their families leading comfortable and secure lives in a high-trust society bonded by a strong sense of community.

To achieve this future, we must sustain rapid and inclusive growth. Recognizing innovation's crucial role in boosting productivity and supporting such growth, the Philippine Development Plan, or the PDP 2023-2028, underscores the importance of innovation in achieving deep socioeconomic transformation. Indeed, establishing a dynamic innovation ecosystem is one of the Plan's cross-cutting strategies. A vibrant innovation ecosystem will enable the translation of knowledge and ideas into new and improved products and services that will inevitably help improve the Filipino people's quality of life.

Elaborating on the broad strategies laid out in the PDP, the National Innovation Council spearheaded the formulation of the National Innovation Agenda and Strategy Document (NIASD) 2023-2032. The NIASD outlines the country's ten-year vision and long-term goals – including priorities and strategies – for improving the country's innovation governance.

In Chapter 1, we contextualize the formulation of the NIASD, describing multiple scenarios that might happen in the next ten years and beyond, based on futures-thinking and strategic foresight exercises.

In Chapter 2, we assess the state of the country's innovation ecosystem based on the metrics and indicators measured in the Global Innovation Index (GII). We also identify challenges and opportunities that can facilitate the establishment of a dynamic innovation ecosystem.

In Chapter 3, we define and characterize a dynamic innovation ecosystem, taking off from our assessment of our innovation performance and our identified preferred future. In doing so, we describe the critical elements of a dynamic innovation ecosystem – its key actors and activities that will proactively and continuously bring about new or improved products and processes that are market-valued, market-driven, and market-oriented.

In Chapter 4, we present the core of the NIASD: the strategies that will establish a dynamic innovation ecosystem through its identified enablers. The thrust includes harmonizing government efforts in advancing innovation in the country; formulating conducive policies for science, technology, and innovation; improving and establishing innovation infrastructures; and implementing programs, including financing, for Filipino innovators across the academe, scientific community, businesses, and MSME sectors.

Finally, in Chapter 5, we identify the NIASD's core targets towards attaining higher rankings in the GII by improving our performance in innovation inputs and outputs.

To achieve Filipinnovation for a resilient and future-ready nation, we must foster a culture that embraces creativity, leverages scientific expertise, cultivates technological competence, and empowers Filipino entrepreneurs to improve the lives of all Filipinos. This roadmap will guide all stakeholders in creating a dynamic innovation ecosystem toward a *Smart and Innovative Philippines*.



Secretary, National Economic and Development Authority Vice-Chair, National Innovation Council

INTRODUCTION



THE NATIONAL INNOVATION AGENDA AND STRATEGY DOCUMENT

The National Innovation Agenda and Strategy Document (NIASD) contains the country's vision and longterm goals for innovation. It also provides a roadmap and the strategies for improving innovation governance; deepening and accelerating innovation efforts; and integrating and fostering public-private partnerships.¹ The formulation of the NIASD follows a collaborative and forward-looking approach, benefitting from inputs coming from the academe, international experts, business sector, and various agencies of government.

The goal of the National Innovation Agenda is to transform the country into a Smart and Innovative Philippines that is productive, resilient, sustainable, and inclusive. Employing innovation as a major transformation strategy means that we will be people who can easily collaborate, analyze current and upcoming threats and opportunities; and accordingly, create new ideas. There will be those who can build prototypes and continuously improve on new ideas through experimentation; there will be entrepreneurs who can bring these to the target consumers; and finally, Filipino consumers who are willing to explore new ways of doing things and provide constructive feedback on their user experience. The end product, which benefits from experimentation and feedback from sophisticated Filipino consumers, will then be distributed across various markets including the rest of the world. This scenario makes up a dynamic innovation ecosystem.

This first NIASD covers the period 2023-2032, which means that foundational strategies and reforms will be implemented within the ambit of the Philippine Development Plan (PDP) 2023-2028. Establishing a dynamic innovation ecosystem is among the six items in the transformation agenda identified in the PDP to achieve a prosperous, inclusive, and resilient society. Chapter 8 of the PDP 2023-2028 elaborates on this agenda by situating it within the continuum of research and development, technology, and innovation. The four outcomes of this Chapter (see Figure 1) mirror the four key elements of a dynamic innovation ecosystem, namely: scientific exploration, engineering and design, product development, and market feedback. These innovation activities provide support for an entrepreneur to innovate continuously, and come up with new and improved products, services, or processes.

The government's role is critical in the establishment of a dynamic innovation ecosystem. This is described in the NIASD, particularly on the use of key instruments such as the National Innovation Council, innovation policies, programs, infrastructure, and finance; which provide an enabling environment for entrepreneurs and innovation actors. Ten priority areas for innovation have also been identified. The selection was based on Section 10 of Republic Act No. 11293 or the Philippine Innovation Act and the sectors that were most adversely affected by the COVID-19 pandemic which highlighted the need for innovation. These ten priority areas are (a) learning and education, (b) health and well-being, (c) food and agribusiness, (d) finance, (e) manufacturing and trade, (f) public administration, (g) transportation and logistics, (h) security and defense, (i) energy, and (j) blue economy and water. Digital transformation is expected to be mainstreamed in all priority areas. Moreover, accessibility and affordability of innovations will be emphasized to ensure inclusiveness, while also making sure that there is consideration for efficiency, climate action, and adaptation.

The future, both immediate and distant, is expected to be volatile, uncertain, complex, and ambiguous. Developing a dynamic innovation ecosystem is critical to achieving AmBisyon Natin 2040, the Filipino people's aspiration for a *matatag* (strongly-rooted), *maginhawa* (comfortable), *at panatag na buhay* (secure life) for all Filipinos.

1 See Section 9 of the Philippine Innovation Act.



Figure 1. Strategy Framework to Advance Research and Development, Technology, and Innovation (NEDA, 2023)

THE NIASD CO-CREATION PROCESS

The NIASD is the result of a collaborative effort through a series of co-creation workshops and consultations with national and regional government agencies, local government units, and the private sector (academe, scientific community, business, and MSMEs). The whole process of formulation was guided by the objectives of the Philippine Innovation Act and the PDP 2023-2028. Additionally, the NIASD's formulation drew inspiration from existing plans and studies that aim to advance science, technology, and innovation, such as the Pagtanaw 2050; Harmonized National Research and Development Agenda 2022-2028; Inclusive Filipinnovation and Entrepreneurship Roadmap 2019; National Cybersecurity Plan 2022 and 2023-2028; Inclusive Innovation Industrial Strategy 2019 (i³s); Go Digital Pilipinas Movement; National Artificial Intelligence Strategy Roadmap; USAID STRIDE Philippines Innovation Ecosystem Assessment 2019 Update; and the Chandler Institute of Governance - Thematic Report on Technological Innovation 2022.

Recognizing innovation as a vital driver of economic growth, the NIASD serves as a strategic guide for innovation policymakers, government agencies, startups, incubators, accelerators, MSMEs, the R&D community, academia, entrepreneurs, investors, and innovation champions across the country. It is a living document intended for regular review and updates as necessary, to ensure its alignment with emerging technologies, trends, scenarios, and the evolving needs of the people and the industry.



CHAPTER 1 BACKGROUND & RATIONALE



BACKGROUND AND RATIONALE

The Philippine population² is estimated at almost 112.5 million in 2022 and is expected to increase to 126.3 million by 2032. Given a total land area of 300,000 square kilometers (km^2), this brings the population density of the country to 452 people per km^2 by 2032, almost double the figure in 1995.

Using the 2020 Census of Population and Housing, the median age in 2020 is 25.3 years while the dependency ratio declined to 57 (48 young dependents and 8 old dependents) for every 100 individuals of working age. The corresponding figures in 2015 were 24.3 years median age, and 58 (50 young dependents and 8 old dependents), respectively.

The country is expected to reach upper middle-income status by 2025. This projection is based on the strong economic performance of 7.6 percent growth in 2022, which signals economic recovery coming from the deep economic contraction due to the COVID-19 pandemic. For the years following, the PDP 2023 - 2028 targets a growth rate in the gross domestic product by 6.0 to 7.0 percent in 2023 from 6.5 to 8.0 percent in 2024 to 2028.

The PDP 2023-2028 is an elaboration of a development agenda on economic and social transformation for a prosperous, inclusive, and resilient society. At the heart of the transformation agenda is the establishment of a dynamic innovation ecosystem. As the population continues to grow, it is essential to develop sustainable and innovative solutions that can meet growing demands amid fast-dwindling resources and harsher conditions. By using new products and services, and adopting new ways of production and consumption, the Philippines can accelerate its economic growth and sustain it.

The period covered by the current PDP, which is 2023-2028, presents an opportune time for the Philippines to establish a dynamic innovation ecosystem. The policy framework has been put in place, and there are existing initiatives across the government and in the private sector. The society has come to realize the critical role of innovation in achieving the Filipino people's collective aspirations as a country. This administration is leading the transformation agenda centerpiece: to establish a dynamic innovation ecosystem.

² UNFPA (2023). <u>Population trends | Population Data Portal (unfpa.org)</u>. Accessed on 7 April 2023.

THE PHILIPPINES BY 2040

In turning our vision of the future into a reality, it must consider how the present conditions will drive the future, while also acknowledging the weight of the past. It is then important to carefully characterize the future we do not want and the future we want.

The co-creation workshops conducted to formulate the NIASD began with futures thinking or foresight exercises to describe multiple scenarios that might happen in the next ten years and beyond. In particular, the unwanted futures have been identified, namely, *masakuna, langit-lupa, at mabagal*. These are discussed in the following sections.

To provide contrast to the unwanted futures, reference was made to the survey and extensive consultations conducted in 2015 to determine what Filipinos want to be, want to do, and want to have. The collective aspiration, referred to as *AmBisyon Natin* 2040, is to have a "*matatag, maginhawa, at panatag na buhay*." Executive Order No. 5 Series of 2016 adopted the *AmBisyon Natin* 2040³ as the long-term vision of the country. In the NIASD, the *AmBisyon Natin* 2040 embodies the future that we want.



³ Read more about AmBisyon Natin 2040: https://2040.neda.gov.ph

OURUNWANTED'

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Masakuna distress and disasters

Technology is advancing, but it cannot be utilized to solve the climate crisis.

Natural and human-induced hazards, aggravated by climate change and governance challenges such as poor planning, coordination, and management, and lack of accountability—pose risks to health, income, livelihoods, food security, human security, and economic growth.

Climate change manifested through stronger and more frequent extreme weather events, slowonset climate change events (e.g., sea-level rise, drought, and ocean acidification) and other disasters like earthquakes, volcanic eruptions, and fires—cause damage to properties, endanger lives, and reverse economic gains. Support from the government, non-government organizations (NGO), and civil society stakeholders is not enough to protect people from the impact of distress and disasters.

Resource-intensive industries and resource-dependent communities have low capacities to adapt to climate change and prepare for disasters. Communities are caught unprepared for natural disasters, causing disruptions in basic services, leaving the grassroots and indigenous communities powerless to defend themselves.

Environmental degradation, which is manifested by poor air and water quality, biodiversity loss, and water scarcity—worsens the living conditions of marginalized communities and negatively impacts their livelihoods.

Human health is also affected due to increased incidence of climate-sensitive diseases and illnesses such as (a) vector-borne diseases (e.g., dengue, leptospirosis, and malaria); (b) waterborne diseases (e.g., schistosomiasis and cholera); and (c) heat-related illnesses (e.g., sunstroke, heat stress or exhaustion, and dehydration).

There is also an increased prevalence of zoonotic diseases and respiratory illnesses. The emergence of agricultural pests and diseases is left uncontrolled and continuously affect agricultural productivity, food supply chains, and overall food security. Reduced access to affordable, healthful, and safe food items leads to malnutrition, thereby affecting people's overall health and well-being, especially among children.

Langit-Lupa

WIDER INEQUALITIES

Radical and disruptive technological advancements and decentralized production and consumption have emerged and are growing exponentially. Governments and other regulatory bodies are challenged to keep up with technologies due to a lack of anticipatory policy, internal capacities, infrastructure, financial capacity, and safeguards to protect vulnerable populations.

Through rapid worldwide advancement in decentralized technologies, unprecedented changes in production, distribution, delivery, and consumption are happening across the globe. Technology rewards the first adopters.

In contrast, laggards and late adopters remain in deep poverty. Instead of addressing challenges for vulnerable populations, these technological disruptions bring even wider gaps and inequalities in access to human development opportunities (e.g., health, education, finance, technology, and employment) and outcomes (e.g., well-being, prosperity, and resilience).

Advancements in technologies, inequalities in wealth distribution, and educational disparities between fast and slow learners become more prominent, leading to low productivity and slow economic growth. It becomes easier for the rich and privileged to remain resilient, while those in poverty and disadvantaged groups are stuck in their prolonged and worsened situations. The divide undermines social cohesion and foments social, economic, and political instability.



Mabagal SLOW CHANGE

There is considerable technological progress, but society has a slow response to stimuli. Solutions are more reactive than proactive.

Although socioeconomic outcomes have improved, progress is not as swift as with international peers. Extreme poverty and existing inequality have led to a constant but slow movement toward development. The country is slow to address key social and economic challenges through technological innovation, and is thus trailing behind other countries.

Filipino creativity and innovation are not properly nurtured. The education system and curriculum are unable to foster critical thinking, 21st century skills, and competencies for career development.

Bureaucracy, weak institutions, and overregulation stifle creativity and promote a culture resistant to change, leading to obsolete technologies and processes. Institutions are hesitant to change and remain slow to adopt public sector innovations already available in the market. The rigid management of the innovation policies only benefits the few and the lack of decentralization is still prevalent from the top management to the grassroots communities. Government institutions are slow to adopt foresight and anticipatory tools and methods.

Our neighboring economies have started to benefit from technological advancement. However, Filipino society struggles to reap the benefits from research and development (R&D). Social capital has not improved, leading to friction in the adoption of innovations being introduced, including concerns related to data privacy and cybersecurity.

The newly fostered R&D culture induces greater institutional capacity to generate income for Filipino enterprises and workers. However, the adoption of technologies and innovations continues to slow down due to regulatory barriers and low support for the entry of innovation champions in sectors and industries. Stagnant government procurement policies hamper the public sector's innovative and agile actions, leading to slow and inefficient business transactions and information processing. Collaboration across government, NGOs, local government units, industry, academe, and civil society remains in silos and tends to cover only the short or medium term.

THE LIFE WE WANT

BY 2040, FILIPINOS HAVE STRONGLY-ROOTED FAMILY AND COMMUNITY TIES, A COMFORTABLE LIFESTYLE, AND A SECURE FUTURE.



Matatag

Filipino families live together.

There is work-life balance, allowing workers to spend time with family. On weekends, families and friends enjoy moments together in parks and recreational centers.

Filipinos live in a high-trust society with a strong sense of community. There are volunteer opportunities, and Filipinos spend time serving the community, helping others who are in need, and contributing to various causes.

Maginhawa

No one is poor, no one is ever hungry.

Filipino families live in comfortable homes with the desired amenities and secure long-term tenure.

Families and friends are within reach because transport is convenient and affordable, and they can take vacations together within the country and abroad.

Children receive quality education so that they realize their full potential and become productive members of society.

Decent jobs that bring sustainable incomes are available, including opportunities for entrepreneurship.

Panatag

Filipinos feel secure over their entire lifetime.

They expect to live long and enjoy a comfortable life upon retirement.

There are resources to cover unexpected expenses, including own savings and an effective and efficient social protection system.

Filipinos feel safe in all places across the country.

Filipinos trust their government because it is free of corruption and provides service to all its citizens equally.



THE NEED FOR INNOVATION

What is innovation?

The Philippine Innovation Act defines innovation as the creation of new ideas that result in the development of new or improved products, processes, or services which are then spread or transferred across markets. Unlike inventions, which may only include a *novel idea*, innovation should also have aspects of *implementation* and *impact*. It cannot remain a theoretical idea, a policy on paper, or an invention that is not adopted and commercialized.



Why do we need to innovate?

Innovation is vital to long-run, sustained economic growth (particularly with improved production and commercialization processes, which ultimately result in high-quality jobs) and overall national development (particularly with the availability of new or improved products, processes, or services, which tend to raise welfare and living standards). Indeed, there is a long literature strand, both theoretical and empirical, that establishes the nexus between innovation, and growth and development.⁴

For the Philippines, its goal to graduate to a high-income country status consistent with *AmBisyon Natin* 2040, rests on its ability to sustain fast growth over the next 17 years, amidst increasing social, economic, and environmental challenges. Innovation is needed to continuously improve processes, increase efficiency, create opportunities, and address challenges such as climate change and healthcare access. Without innovation, the country will struggle to keep up with and benefit from the rapid global changes and advancements, and may fail to overcome the adverse consequences of being a laggard in a fast-changing world.

A dynamic innovation ecosystem facilitates the creation and translation of knowledge and ideas into highquality and competitive products and services to promote economic growth, well-being, social inclusion, and environmental sustainability. More importantly, it will help us avoid our unwanted futures from becoming reality and can be the key to achieving a *matatag, maginhawa, at panatag na buhay para sa lahat*.

⁴ Maradana et al. (2017), Santacreu (2015), Andergassen et al. (2009), Bae and Yoo (2015), Mansfield (1972), Nadiri (1993), Romer (1986), Solow (1956), and Schumpeter (1911). In particular, Maradana et.al. (2017) showed a strong link between innovation and economic growth using the following indicators of innovation: patents held by residents, patents held by nonresidents, research and development expenditure, researchers in research and development activities, high-technology exports, and scientific and technical journal articles.

Global Innovation Index

The Global Innovation Index (GII) is a global reference tool used to measure an economy's innovation performance. It aims to understand innovation, inform policy decisions, and monitor progress over time.

The GII consists of two sub-indices: (a) innovation input, which covers institutions, human capital, infrastructure, market sophistication, and business sophistication; and (b) innovation outputs, which covers knowledge and technology outputs and creative outputs. The GII 2022 Report utilized 81 innovation indicators; its detailed methodology and definitions are provided in the Annex of this document.

Figure 2 shows a strong positive relationship between investments made in terms of GII inputs in the past (2013) and more recent GII outputs (2019). The lagged values of the GII inputs sub-index are correlated with more current values of the GII outputs sub-index in recognition of the fact that it takes time for innovation investments to be transformed, if at all, into innovation outputs. The Philippines is represented as the red dot above the trendline, implying that the country was able to translate investments in innovation inputs into more innovation outputs compared with other countries that made the same level of innovation investments.



2013 GII INPUTS SUB-INDEX AND 2019 GII OUTPUTS SUB-INDEX

Figure 2. 2013 GII inputs sub-index and 2019 GII outputs sub-index⁵

World Intellectual Property Organization (2022). Global Innovation Index: Interactive Database. WIPO: Geneva. Retrieved from: https://www.globalinnovationindex.org/analysis-indicator.

⁵ Brás, G. R. (2023). Pillars of the Global Innovation Index by income level of economies: longitudinal data (2011-2022) for researchers' use. Data in Brief, 46, 108818. https://doi.org/10.1016/J.DIB.2022.108818.

Figure 3 plots the relationship between the 2013 GII output sub-index and 2019 real GDP per capita (PPP, constant 2017 international USD). Unlike in the previous figure where the fitted trend is linear, this figure shows a non-linear fitted trend with three segments (two inflection points). There is also greater variability around the fitted trend implying that there are more factors that determine real GDP per capita apart from innovation outputs.

The fitted trend shows the average per capita GDP (a proxy for standard of living) for a given level of innovation output. Innovation output is measured with a lag of six years given that it takes time for innovation results to translate into an improved standard of living. The non-linearity of the fitted trend implies that innovation outputs tend to have increasing returns at low and high levels of real GDP per capita (first and third segments). The Philippines (red dot) lies below the fitted trend line, implying that its real GDP per capita in 2019 is lower than that of other countries with about the same level of innovation outputs in 2013.



Figure 3. 2013 GII outputs sub-index and 2019 real GDP per capita 6

The two figures previously shown reveal the major challenges of innovation in the Philippines. Figure 2 highlights the need to increase both innovation inputs and outputs while Figure 3 emphasizes the need to address constraints in translating innovation outputs into improved standards of living or the quality of life in the Philippines.

⁶ Brás, G. R. (2023). Pillars of the Global Innovation Index by income level of economies: longitudinal data (2011-2022) for researchers' use. Data in Brief, 46, 108818. https://doi.org/10.1016/J.DIB.2022.108818.

World Intellectual Property Organization (2022). Global Innovation Index: Interactive Database. WIPO: Geneva. Retrieved from: https://www.globalinnovationindex.org/analysis-indicator.

CHAPTER 2

THE STATE OF THE PHILIPPINE INNOVATION ECOSYSTEM



THE STATE OF THE PHILIPPINE INNOVATION ECOSYSTEM

The Philippines is acknowledged as one of the middle-income economies with the fastest innovation catch-up, alongside China, India, Iran, and Vietnam, while also being among the 26 economies classified as **GII Innovation Achievers**, surpassing expectations considering their respective development levels (WIPO, 2022).



Global Innovation Index Philippines 2011-2022



76th INNOVATION INPUTS 2022



Infrastructure pillar improved in ICT access and ICT use Human capital and research pillar dropped

Institutions pillar showed no improvement

51st INNOVATION OUTPUTS 2022



The ranking dropped due to weaknesses in scientific and technical articles and new businesses per thousand population

Intellectual property (IP) indicators declined

PHILIPPINE PERFORMANCE

IN GLOBAL INNOVATION INDEX PILLARS 2022



INNOVATION PERFORMANCE

Innovation Performance 2011 to 2022. In general, the Philippines' Global Innovation Index (GII) has been on an increasing trend over the last decade. From 2015, the Philippines' GII ranking showed significant improvement, reaching its highest ranking of 50th in 2020. While its GII ranking dropped to 51st in 2021 and 59th in 2022 (see Table 1), the Philippines has been recognized as one of the middle-income economies with the fastest innovation catch-up along with China, India, Iran, and Vietnam (WIPO, 2022).

Economy	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Latest Rank in ASEAN
Singapore	3	3	8	7	7	6	7	5	8	8	8	7	1
Malaysia	31	32	32	33	32	35	37	35	35	33	36	36	2
Thailand	48	57	57	48	55	52	51	44	43	44	43	43	3
Vietnam	51	76	76	71	52	59	47	45	42	42	44	48	4
Philippines	91	95	90	100	83	74	73	73	54	50	51	59	5
Indonesia	99	100	85	87	97	88	87	85	85	85	87	75	6
Brunei Darussalam	75	53	74	88			71	67	71	71	82	92	7
Cambodia	111	129	110	106	91	95	101	98	98	110	109	97	8
Lao PDR		138								113	117	112	9
Myanmar				140	138					129	127	116	10
Total number	125	141	142	143	141	128	127	126	129	131	132	132	-

Table 1. ASEAN countries GII ranking from 2011-2022

Source: World Intellectual Property Organization (WIPO), 2022

Among the Association of Southeast Asian Nations (ASEAN), the Philippines ranked 5th from 2015 to 2022. Based on the GII 2022 ranking of our peers, Thailand was already in the top 1/3 of countries in the world in terms of rank, while Vietnam almost made it to the top 1/3 (WIPO, 2022). The GII 2022 report further recognizes the Philippines as one of the 26 economies that belong to the GII Innovation Achievers. These are economies that have performed above expectations relative to their respective levels of development. The Philippines also obtained this recognition in 2019 when it significantly increased its ranking from 73rd to 54th. The Philippines currently falls behind by a few ranks, but has high potential to rise up the world ranking given strengthened innovation efforts and investments from both government and private sectors.

In the PDP 2023 - 2028, the country targets to improve its ranking to 43rd by 2028, which will bring it to the top 1/3 in the world. A closer look at the sub-indicators and a comparison with neighboring countries (see *Table 2*) will help determine which aspects of innovation need to be emphasized. For instance, in terms of innovation inputs, the country invests only, 0.3 percent of its gross domestic product (GDP) on research and development (R&D), far below the United Nations Educational, Scientific, and Cultural Organization (UNESCO) recommendation of one percent. The country also has a relatively low number of researchers per million population (e.g., less than 10% of Thailand's and around 23% of Vietnam's). In terms of innovation outputs, the Philippines has a relatively low value of patents by origin and a low number of new businesses, including startups, per thousand working-age population.

2022 GLOBAL INNOVATION INDEX RANKING

IN THE ASEAN REGION

Among the Association of Southeast Asian Nations (ASEAN), the Philippines ranked 5th from 2015 to 2022. Based on the GII 2022 ranking of our peers, Thailand was already in the top 1/3 of countries in the world in terms of rank, while Vietnam almost made it to the top 1/3 (WIPO, 2022).



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	Gll Indicators	Brunei melessureO	eibodmeO	eisənobnl	neqeL	eizveleM	Myanmar	səniqqilind	Republic of Korea	Singapore	bneliedT	msN təiV
	1.1.2 Government Effectiveness	1.4	-0.4	0.4	1.6	1	-	0.1	1.4	2.3	0.3	0.2
	1.2.1 Regulatory Quality	0.9	-0.6	0.1	1.4	0.8	-0.6	0	-	2.2	0.2	-0.1
	1.3.1 Policies for doing business	4.1	3.6	4.9	4.9	4.7	2.9	3.4	4.2	6.3	3.6	4.8
	2.2.2 Graduates in Science and Engineering, %	38.4	23.2	19.4	19.7	38.9	33.7	22.8	29.6	35.4	27.9	22.7
:	2.3.1. Researchers, FTE/mn pop.	0	30.4	395.7	5454.7	2184.7	31.9	173.6	8713.6	7287.3	1790.2	756.7
sìn	2.3.2. Gross Expenditure on R&D, % GDP	0.3	0.1	0.3	3.3	1	0.1	0.3	4.8	1.9	1.1	0.5
duj	2.3.4. QS university ranking, top 3	23.4	0	35.9	80.7	58	0	20.3	75.7	69.4	33.2	8.1
uoj	3.1.1 Information and Communication Technology (ICT) Access	8.3	7.1	8.9	9.2	9.4	0	6.9	9.5	10	9.2	9.1
iev	3.1.2 ICT Use	7.4	5.4	5.8	7.9	7.4	0	4.8	8.7	7.6	7.3	6.2
oui	4.1.1 Finance for Startups and Scale-ups	0	0	6.2	5.1	6.5	0	0	5.2	0	5.5	4.4
ц	4.2.2 Venture Capital Investors, deals/bn PPP\$ GDP	0	0.1	0	0.1	0	0	0	0.1	-	0	0
	5.1.2 Firms Offering Formal Training, %	0	22.2	7.7	0	18.5	5.9	59.8	0	0	18	22.2
	5.2.1 University-industry R&D Collaborations	4.1	3.3	5	4.5	4.2	2.3	3.7	4.9	5.1	4.2	4.5
	5.3.4 Foreign Direct Investments (FDI) Net Inflows, % GDP	3.8	13.6	1.9	0.8	2	2.5	2.3	0.6	26.7	0.8	6.1
	5.3.5 Research Talent, % in businesses	0	4.3	7.5	74.7	15.8	0	51.8	81.8	52.2	60.8	24.1
	6.1.1. Patents by Origin/bn PPP\$ GDP	0.2	0	0.4	42.8	1.1	0	0.5	77.9	3.2	0.7	٢
	6.1.3. Utility Models by Irigin/bn PPP\$ GDP	0	0	0.7	0.8	0.1	0	1.5	2	0	2.6	0.4
sìn	6.2.2. New Businesses/th pop.	-	0.5	0.3	0.5	2.1	0.4	0.2	0	10	1.3	1.7
dın	6.2.5. High-tech Manufacturing, %	3.3	0	29.9	55.2	45.5	17.7	38.7	56.3	74.7	44	29.9
0 1	6.3.3. High-tech Exports, % total trade	0.2	1.5	3.8	13.1	46.9	1.4	39.7	28.8	29.4	18.6	37.3
ioi	7.1.2. Trademarks by origin/bn PPP\$ GDP	8.2	39.5	24.4	64.6	20.4	24	33.6	116.2	22.9	26.1	72.4
ела	7.1.3. Global Brand Value, top 5,000, % GDP	0	0	36.1	154.6	141.9	5.7	41.8	203.4	134.9	71.9	88.2
ouu	7.2.1. Cultural and Creative Services Exports, %	0	0	0	0.4	0.3	0.3	0.1	0.8	4.6	0	0
I	7.2.5. Creative goods exports, % total trade	0.1	0.6	2.3	1.8	9.3	0.7	6.3	5	3.8	8.4	7.8
	7.3.4. Mobile App Creation/bn PPP\$ GDP	0	0.2	0.2	0.5	0.1	0	0.2	1.2	5.3	0.2	2.6

Source: World Intellectual Property Organization (WIPO), 2022

FRAMEWORK OF THE GLOBAL INNOVATION INDEX



Intangible assets Creative goods and services Online creativity

Figure 4. Framework of the Global Innovation Index (WIPO, 2020)
Table 3 shows the latest GII scores of the Philippines for 2021 and 2022 and further reveals the impact of the COVID-19 pandemic on innovation performance.

Innovation Inputs. Overall, the Innovation Input sub-index dropped by four rankings from 72nd in 2021 to 76th. Under the infrastructure pillar, the country improved its performance in ICT access and ICT use. The human and research pillar dropped from 80th in 2021 to 86th in 2022 (see Table 3). The country's graduates in science and engineering dropped to 22.5 percent, gross expenditure on R&D remained at 0.32 percent of GDP, and researchers FTE increased to 174 per mn/pop in 2022. Under the institutions pillar, the country saw no improvement in terms of regulatory environment and policies for businesses.

Innovation Outputs. From 2021 to 2022, the country's ranking in terms of the Innovation Output sub-index dropped from 40th to 51st. The Philippines remains weak in innovation outputs, such as scientific and technical articles and new businesses per thousand population. Similarly, the year 2022 saw declines in indicators related to intellectual property (IP) such as patents by origin, IP receipts, trademarks by origin, and cultural and creative services exports.

	PHILIPPINES	2021	2022
	OVERALL RANK	51st	59th
In	novation Inputs	72nd	76th
1.	Institutions	90th	90th
	1.1.1 Regulatory Quality	n/a	0
	1.2.1 Policies for doing business	n/a	3.4
2.	Human capital and research	80th	86th
	2.2.2. Graduates in science and engineering, %	28.7	22.8
	2.3.1 Researchers FTE/mn pop	105.7	173.6
	2.3.2 GERD, % GDP	0.3	0.3
3.	Infrastructure	86th	81st
	3.1.1 ICT access	4.4	6.9
	3.1.2 ICT use	4	4.8
4.	Market sophistication	86th	78th
	4.1.1 Finance for startups and scaleups	n/a	0
	4.2.2 Venture capital investors, deals/bn PPP\$ GDP	78.6	0
5.	Business sophistication	33rd	39th
	5.1.2 Firms offering formal training, %	59.8	59.8
	5.2.1 University- industry R&D collaboration	3.6	3.7
	5.3.4 FDI net inflows, % GDP	2.7	2.3
In	novation Outputs	40th	51st
6.	Knowledge and technology outputs	24th	41st
	6.1.1 Patents by origin/bn PPP\$ GDP	0.5	0.5
	6.1.3 Utility models by origin/bn PPP\$ GDP	2.5	1.5
	6.2.2. New businesses/th pop.	0.3	0.2
	6.2.5. High-tech manufacturing, %	40.3	38.7
	6.3.3. High-tech exports, % total trade	32.3	39.7
7.	Creative Outputs	65th	58th
	7.1.2 Trademark by Origin/bn PPP\$ GDP	34	33.6
	7.1.3 Global brand value, top 5,000, % GDP	11	41.8
	7.2.1 Cultural and creative services exports, % total trade	0.2	0.1
	7.2.5 Creative goods exports, % total trade	6.3	6.3

Table 3. Philippine Performance in Global Innovation Index Pillars, 2021–2022

Source: Global Innovation Index GII 2021 and 2022

OPPORTUNITIES IN THE PHILIPPINE INNOVATION ECOSYSTEM



Cognizant of the importance of innovation in driving the country's economic development, the government has enacted several reforms and policies and implemented initiatives to support innovation in the country. The percentage share of R&D expenditures in the country's GDP (GERD) had been increasing from 2009 (0.11) to 2018 (0.32). These initiatives can facilitate the establishment of a dynamic innovation ecosystem.

- **1. Enacting enabling policies for innovation.** In addition to the Philippine Innovation Act, the country has enacted several related legislative measures that aim to support startups and entrepreneurs in scaling up their innovative solutions and improve innovation governance in the country:
 - a. The Innovative Startup Act (RA 11337). This law was enacted in 2019 and aims to strengthen, promote, and develop an innovative and entrepreneurial ecosystem and culture in the Philippines. It focuses on providing benefits and removing constraints to encourage the establishment and operation of innovative new enterprises and businesses. In 2020, the Department of Trade and Industry (DTI) reported that the Philippines has more than 1,100 startups, 35 incubators and accelerators, 50 investors, 200 co-working spaces, and 40 venture capitalists (PWC Philippine Startup Survey Report 2020). Metro Manila's Startup Ecosystem Value grew from USD2.1 billion to USD3.5 billion. Metro Manila is also recognized for being in the Top 20 Asian Ecosystem in Funding, Top 30 Asian Ecosystem Report 2023). Meanwhile, Naga, Iloilo, Cebu, and Davao were hailed as potential innovation hubs (Global Startup Ecosystem Report, 2022).

- b. Philippine Digital Workforce Competitiveness Act (RA 11927). This law aims to enhance the country's digital workforce competitiveness and establish the Inter-agency Council for Development and Competitiveness of Philippine Digital Workforce. The law also mandates the development of a digital technology and digital skills roadmap, which will be based on a national skills mapping that will identify skills competencies and gaps and shall serve as the basis for the design and implementation of programs for the upskilling, re-skilling, and training of the workforce.
- c. Ease of Doing Business and Efficient Delivery of Government Services Act (RA 11302). This law aims to streamline the procedure for the issuance of local business licenses, clearances, permits, certifications, or authorizations. Local government units (LGUs) must establish unified business application forms, automate permit and licensing system, and lessen transaction requirements. The goal of such changes is to expedite the process followed by local businesses, thereby contributing to an enabling environment for adapting innovation into business and market practices. The law further emphasizes the importance of policy in flourishing business environments.
- d. Amendments to the Public Service Act (RA 11659). This law aims to liberalize key public services by distinguishing public services from public utilities. Full foreign ownership is allowed in public services which now includes airports, railways, expressways, and telecommunications. Meanwhile, the issue of national security is addressed not by imposing foreign ownership restrictions but by using instruments such as national security review and performance monitoring.
- e. Technology Transfer Act of 2009 (RA 10055). This law was enacted to promote the effective use, protection, management, and commercialization of IP assets that were generated from publicly funded R&D. In 2015, the Department of Science and Technology (DOST) issued a set of IP policies that provided guidelines on IP management, technology transfer protocols, and issuance of fairness opinion reports. This enabling policy resulted in 466 patents, 2,069 utility models, and 875 industrial designs filed by Filipinos in 2018. In 2020, the Intellectual Property Office of the Philippines also launched the National Intellectual Property Strategy 2020-2025. This roadmap aims to establish an effective and robust IP system that will enable enforceable IP rights; improve innovation performance through the Innovation and Technology Support Offices; and promote the effective use of IP for economic, cultural, and scientific development.
- f. Regional Comprehensive Economic Partnership (RCEP). The RCEP Agreement broadens and deepens ASEAN's engagement with Australia, China, Japan, Korea, and New Zealand. It aims to establish a modern, comprehensive, high-quality, and mutually beneficial economic partnership that will facilitate the expansion of regional trade and investment and contribute to global economic growth and development. It is also expected to open opportunities for the country to collaborate with countries considered as innovation leaders.
- g. **Personal Property Security Act (RA 11057).** This law aims to create a conducive legal environment for innovation. It recognizes IP as an intangible property that can be registered as collateral for credits and loans.

⁷ De La Peña, F.T. (2020). Global Innovation Index 2020: Chapter 8–FILIPINNOVATION: Financing Science for the People. World Intellectual Property Organization. Retrieved from https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020chapter10.pdf.

- h. **Philippine Competition Act (RA 10667).** The Act aims to encourage, promote, and protect the competitive market by looking at the economic concentration and control of product distribution. Trade and industry should consequently flourish without the manipulation, constriction, and penalization of anti-competitive schemes.
- 2. Increasing government support to programs and initiatives promoting inclusive innovation. The government has been implementing several programs and initiatives for the growing startup community, incubators, accelerators, and venture capitalists in the country. For instance, in 2014, the DOST established the Science for Change (S4CP) as the flagship program to accelerate science, technology, and innovation in the country to keep up with global technology. Through this program, R&D funding to regions increased from seven (7) percent in 2014 to 20 percent in 2019. To facilitate the transfer of R&D outputs from the academe to the market, the DOST also established over 30 technology business incubators all over the country. In 2021, through the DOST-S4CP, 10 new research projects under the Niche Centers in the Regions for R&D (NICER) were introduced that shall focus on the areas of industry, energy, disaster risk reduction, climate change, and health.

The above initiatives were complemented by DTI's program on Inclusive Innovation and Industrial Strategy (i^3s) that was launched in 2019. The i^3s provides a roadmap for the establishment of regional inclusive innovation hubs, development of human capital for innovation and entrepreneurship, and promotion of academe-industry-government convergence.

In addition, the DOST institutionalized the Balik Scientist Program (BSP) in 2018. It aims to encourage Filipino scientists, technologists, and experts to return to the country and be engaged in various R&D projects. This will strengthen the country's science and technology (S&T) capabilities and promote knowledge and technology sharing.

- **3.** Promoting collaboration among innovation stakeholders. Recognizing the importance of collaboration among the innovation stakeholders, the DOST and DTI established Regional Inclusive Innovation Centers (RIICs) that serve as venues for collaboration among government, academe, and industry players. Currently, RIICs have been established in Bicol, Central Visayas, Northern Mindanao, and Southern Mindanao Regions.
- 4. Providing avenues for collaboration between academe and industry. The Collaborative Research and Development to Leverage Philippine Economy (CRADLE) program under the S4CP, also enables more collaboration between the academe and industry by shifting from publication-centric to industry-driven R&D activities. The CRADLE program facilitated greater collaboration and partnership between the academe and private companies, engendering greater private sector trust and investments in R&D outputs.

To support entrepreneurship and innovation, DTI also implemented the Negosyo Center Program to promote ease of doing business and facilitate the access of micro-, small-, and medium enterprises (MSME) to various support services. For technology upgrades, DOST's Small Enterprise Technology Upgrading Program (SETUP) allows MSMEs to avail funding support for technology and scientific interventions that will improve their operations.

CHALLENGES IN THE PHILIPPINE INNOVATION ECOSYSTEM



Despite the improved rankings in the GII, and the policies and strategies in place to encourage innovation, various surveys, and studies⁸ point to the following challenges within the Philippine innovation ecosystem.

- 1. Inadequate human capital and resources for R&D. The country's share of R&D expenditure in GDP (now at 0.32%) remains below the global average of 2.04 percent and the one percent benchmark recommended by the UNESCO. The country also had less than 174 full-time researchers per million population in 2022, which is relatively low compared to the other lower-middle income countries. The public and private sectors also face a growing shortage of human resources, especially science, technology, engineering, and mathematics (STEM) graduates, mainly due to lower salaries; while emigration further contributes to the brain drain. The existing educational curriculum is also not aligned and responsive to the industry's needs for innovation. Hence, the country will potentially face a shortage of S&T professionals in the future.
- 2. Limited infrastructure for R&D and capacity to innovate. The current infrastructure remains inadequate to provide researchers with the necessary equipment to do R&D. As a result, Philippine universities are seen to lack agility, talent, and access to the latest technologies. Further, the technology transfer and licensing offices housed in universities also lack the capabilities to produce patenting and licensing metrics to facilitate knowledge transfer. While government funding for innovation tools and facilities has increased, the support for innovation in terms of financing, loan, and infrastructure, is still burdened by bureaucratic protocols, leading to underutilization of funds allocated for scientific, technological, and innovation projects.

⁸USAID-STRIDE Assessment Report, Chandler's Institute of Governance Report, and Chapter 8: Advance Research and Development, Technology, and Innovation of the PDP 2023-2028.

- **3.** Weak linkages and limited collaboration among the innovation actors. The alignment and linkages across innovation actors and stakeholders are weak and underdeveloped. Collaboration among the government, industry, and academe is limited due to the industry's lack of awareness of major programs, complex regulations and policies, and outdated rules and procurement processes that are seen as barriers to innovation. Funding, which is critical for commercialization, is also hampered by regulatory and bureaucratic processes and limitations, discouraging researchers and organizations from accessing these funds. On the other hand, researchers also lack awareness of the current demand, trends, technologies, and solutions, resulting in R&D activities and products that are not responsive or aligned with the market and its system requirements. Cultural differences and speed mismatch across stakeholders also contribute to the lack of collaboration and prevent stakeholders from proactively engaging within the ecosystem.
- 4. Fragmented innovation policies and programs. Support for the various stages of the innovation process, from creation to commercialization is either fragmented, overlapping, or limited. The current ecosystem needs to bridge gaps and streamline financing programs and loan facilities to support startups and S&T spinoffs, as the latter remains rare. Fragmented innovation policies in the country also result in duplication of efforts and resources. Various government agencies formulate and execute different plans, roadmaps, and programs focused on innovation but lack a unifying plan or a coordinating body to ensure policy coherence, alignment of priorities, and effective coordination among agencies.

CHAPTER 3

THE DYNAMIC INNOVATION ECOSYSTEM



THE DYNAMIC INNOVATION ECOSYSTEM

Learning from the previous years' innovation progress, we aim to take a more proactive role in enabling innovation to be a key driver of sustained long-run economic growth by establishing a dynamic innovation ecosystem that will encourage and sustain innovation in the country.

The Innovation Ecosystem

The innovation ecosystem is formed by a dynamic and complex relationship among innovation actors. They work together in performing innovation activities that transform ideas into new or improved products and services that are market-valued, market-driven, and market-oriented.

Innovation actors include the academe, government, industries, financing institutions, entrepreneurs, science, technology, engineering, and mathematics (STEM) and Accountancy, Business, and Management (ABM) professionals, social scientists, creatives, research and development (R&D) institutions, and civil society organizations. On the other hand, innovation activities include ideation, design thinking, hackathon, digital transformation, and technology development; prototyping, product engineering, research and development; incubation, and market testing, towards financing these developments to patenting, commercialization, and acceleration, among others.

These actors and interactions are visualized in an ecosystem framework (see Figure 5) inspired by the Cyclical Innovation Model of Berkhout et al. (2006).



Figure 5. Innovation Ecosystem Framework

Innovation needs to be market-driven and market-oriented, except for basic research and development. The innovation process can be ignited by specialists from the Humanities and Social Sciences who research on consumer preferences and experiences and report on pain points that signal the need for a new way of doing things.

Entrepreneurs⁹ and individuals with business acumen will always look for pain points, opportunities, and market signals and drivers to address these by introducing innovative products, services, and processes. Science and technology experts will undertake basic research to understand the characteristics and uses of various materials existing in nature. Engineering and mathematics experts, who specialize in product design, will transform materials existing in nature into usable forms that can be distributed across markets. Technical and vocational experts like fabricators and machinists will manufacture the products as designed. Experts in creative industries and marketing will add to the commercial appeal of the products. Information and communications technology (ICT) experts will develop the systems and applications for the innovation processes to be efficient.

Figure 5 describes the entrepreneur at the heart of the innovation process, beginning with increased awareness of issues or problems being experienced by the market. The entrepreneur then finds possible solutions already discovered by scientists; then reaches out to engineers or product designers to design a product that can be introduced to the market as a better alternative. The entrepreneur also engages creative and marketing experts to increase the commercial appeal of the product. Ultimately, the final product is introduced to the market. The entrepreneur then continuously solicits feedback from users to further improve the product.

From the description above, innovation is seen to happen not sequentially but rather iteratively. It involves many innovation actors; it requires market information, scientific knowledge, tools, equipment, applications for design and prototyping, and user feedback.

The Dynamics of a Dynamic Innovation Ecosystem

A dynamic ecosystem is characterized by continuous movement of the different components of the ecosystem. In the context of innovation, it means continuous improvement as a result of the continuous movement of various innovation actors. The government then needs to provide the necessary resources to facilitate and remove the barriers that hamper these dynamics, in particular, those that:

- CREATE a pervasive culture of innovation that is market-driven and market-oriented. A culture of
 innovation refers to the behavior of a society that engages in constructive critical thinking that
 challenges the present ways of doing things, co-creates to further explore solutions, and demonstrates
 willingness to try new approaches. People have the drive to learn new things continuously and, in turn,
 add to the existing body of knowledge. Innovators and investors have a healthy appetite for risks
 associated with a new product while consumers are willing to try out new products, fully confident that
 these meet adequate standards of quality and safety.
- 2. **COLLABORATE** with innovation actors using platforms that are active, reliable, and useful. Innovation actors have access to collaboration platforms where they can co-create with other innovators in an atmosphere of mutual trust. These collaboration platforms facilitate access to mentors, within and outside the country, to expand the network for technology transfer and commercialization activities.

⁹Entrepreneurs are key innovation actors who provide direct and significant contributions to national economic growth. According to the Philippine Statistics Authority (2021), 99.6 percent of establishments in the country are Micro, Small and Medium Enterprises (MSME)—enterprises that are below PHP100 million in asset size. Meanwhile, startups are enterprises engaged in innovative business models aiming to solve pressing problems in society, usually using scalable technologies. On the other hand, spin-offs are startups created by a parent organization, usually by large corporations. Promoting the growth and competitiveness of MSMEs, startups, and spin-offs is key to national development.

- 3. CAPACITATE innovation actors with facilities and resources that transform their ideas into innovative products and services. Innovation actors can access the necessary resources and tools to maximize their potential and turn their ideas into innovative products and services. These resources include lifelong learning programs, knowledge products, physical and digital science and technology (S&T) infrastructure, innovation hubs, fabrication labs, shared service facilities, and funding to support innovation activities.
- 4. CONNECT innovation actors with potential commercially viable products to investors and potential markets. There are avenues for innovation actors to connect with investors and/or financial institutions. Innovation actors can easily transact with the government regarding patent applications and product registration. Meanwhile, startups can easily transact with the government concerning business registration.

Innovation Governance for a Dynamic Innovation Ecosystem

The key to establishing a dynamic innovation ecosystem is to improve innovation governance. This refers to institutions, policies, and resources governing policymaking and implementation, such as program delivery and monitoring, as well as coordination and collaboration across public institutions and with relevant stakeholders. The goal of innovation governance is to encourage and direct innovation towards the future we want and avoid unwanted futures in a way that makes efficient and sustainable use of resources.¹⁰

With the leadership of the NIC, various governance levers or enablers (see *Figure 5*) will be developed or enhanced to encourage the establishment of a dynamic innovation ecosystem, such as the following:

- 1. **National Innovation Council** refers to the organizational structure responsible for making decisions and allocating resources to steer the national innovation agenda;
- Innovation Policy is the set of rules and regulations that protect intellectual property, allow time-sharing and resource-sharing, respect the sanctity of contracts, enforce contractual obligations, and such other rules and regulations that enable innovation actors to work together and be engaged in innovation activities. At the same time, these are policies that promote trust among consumers to try out new products;
- 3. **Innovation Infrastructure** provides the physical and digital structure and systems, equipment, and tools necessary to translate ideas into prototypes or sample products that can be tested;
- 4. Innovation Financing provides the resources and funding necessary for various innovation activities, including seed money and incentives to leverage funding for the commercialization of the innovative product; and
- 5. **Innovation Programs** create awareness about the processes involved in innovation, build capabilities of innovation actors and provide opportunities for co-creation and collaboration.



Figure 6. Philippine National Innovation Ecosystem Framework

The presence and quality of the NIC, policy, infrastructure, program, and financing for innovation, enable (or constrain) the innovation ecosystem. The succeeding tables list the specific strategies for each enabler and the suggested implementation timelines – 2023-24, 2025-27, 2028-32. The lead agency is also indicated in the strategy table below. These strategies are expected to contribute to the PDP 2023-2028 innovation targets.

THE STRATEGIES FOR ESTABLISHING

A DYNAMIC INNOVATION ECOSYSTEM



I. National Innovation Council

THE GENERAL OBJECTIVES ARE TO:



Strengthen the capability of the NIC

as the primary coordinating body for the country's innovation goals, priorities, and strategies



Mainstream innovation

in sectoral and local plans, and investment programs



SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD	
Strengthen the capabi priorities, and long-ter	Strengthen the capability of NIC to develop the country's innovation goals, priorities, and long-term national strategies			
Rationalize all innovation- related governing bodies and inter-agency councils	Continue the policy and regulatory reform agenda to encourage innovation and innovative start-ups	Monitor policies and regulatory reforms		
Institutionalize strategic foresight in the planning units of the public sector	Establish Innovation units in national government and regional line agencies	Monitor foresight activities across the government agencies		
Establish technical working committees that will implement and monitor the National Innovation Agenda and Strategy Document (NIASD) implementation	Review the implementation of the NIASD and realign targets and priorities as deemed necessary	Conduct an impact evaluation of the NIASD implementation		
Streamline and harmonize policies, regulations, and programs to encourage innovation and innovative start-ups			NIC	
Improve data support policies for the monitoring of the Global Innovation Index (GII) and relevant competitive indices (e.g., Global Startup Ecosystem Rankings)				
Strengthen the presence of NIC at the regional/local level by closely coordinating with the Regional Development Councils (RDC) and its Regional R&D and Innovation Committee (RRDIC), and the Regional Inclusive Innovation Centers (RIIC)	Review and approve the budget for innovation programs, projects, and activities at the regional level	Monitor and assess innovation programs, projects, and activities in the regions		

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Establish the Diaspora for Innovation and Development Program to encourage the participation of the Filipino diaspora in the country's innovation initiatives (Sec. 18)	Engage technological expertise in strategic and innovation policymaking through the S&T Advisory Council (STAC) and Foreign Service Offices	Monitor the implementation of the Diaspora for Innovation and Development Program and the participation of the Filipino diaspora in the country's innovation activities and programs	
Develop a "relevance criteria" that will be administered by the agencies concerned in the selection of research, development and extension (RD&E) programs or projects for funding (Sec. 15)	Establish or recognize institutions as centers of research excellence and research collaboration based on the relevance criteria for RD&E	Monitor the implementation of research projects in the research centers to ensure alignment with the R&DE relevance criteria	NIC
Capacitate all government offices on innovation and agile planning tools such as design thinking, systems thinking and futures thinking, among others			
Monitor implementation of the Innovation Act	Monitor implementation of the Innovation Act	Conduct a sunset review of the Act	

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Mainstream innovation	in sectoral and local pl	ans and investment prog	grams
Review and approve framework for categorizing region specialties and comparative advantages based on priority areas	Establish a Cluster Development Program focused on regional hubs or provinces or sectors (Sec. 14)	Monitor and evaluate the implementation of the Cluster Development Program	
Promote and establish the necessary conditions and framework that will encourage local and international innovation alliances (Sec. 25)	Establish recognition or accreditation systems for innovation alliances that engage in collaborative R&D and investments for innovative projects	Monitor and evaluate innovation alliances that promote regional networking, technology sharing, and collaborative R&D	NIC
Integrate innovation as an indicator or assessment criteria in the performance evaluation of the public sector (i.e., Key Performance Indicator of national government agencies and Seal of Good Local Governance for LGUs)	Updating civil service requirements, competency requirements, and workplace environment to ensure continuous development of methods in business practices, workplace organization, or external relations	Monitoring and evaluation of the civil service's multi- dimensional and multi-level capacities for innovation	

II. Innovation Policy

THE GENERAL OBJECTIVES ARE TO:

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Increase investments and expenditures

for R&D and innovations both in the public and private sectors

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Establish an agile regulatory standard

designed for innovative products and services at the early stage of development/business



Implement reforms and formulate guidelines that will streamline various transactions within the innovation ecosystem



Enact policies that will improve competition, business, and regulatory environment for innovations



Align education and human capital development programs with the needs of the current industry and emerging market demands



SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Increase investments a and private sectors	and expenditures for R&	D and innovations both	in the public
Review and assess existing policy instruments that govern the allocation of budget for research and development being undertaken in National Government Agencies (NGA) and State Universities and Colleges (SUC)	Issue policy measures (i.e., executive orders) to ensure allocation of the national budget for research and development, technology development and innovation are within the global standard, including the establishment of an innovation development program convergence	Conduct routine independent third-party monitoring to complement in-house monitoring of the policy measures on budget allocation and innovation development program convergence in alignment with global standards	National Economic and Development Authority (NEDA) (Lead), Department of Science and Technology (DOST), Department of Trade and Industry (DTI), Department of Agriculture (DA), Department of Information And Communications Technology (DICT), Department of Finance (DOF), Department of Finance (DOF), Department of Budget and Management (DBM), Department of the Interior and Local Government (DILG), Intellectual Property Office of the Philippines (IPOPHL)
Review and assess existing procurement guidelines to facilitate implementation of publicly-funded R&D, and ease up government procurement of innovative services and products from startups and private entities.	Develop policy measures and monitoring mechanisms that will promote and invite private sector investment in R&D, including push and pull mechanisms	Review and enhance policy measures for increased return on investment of private sector on prioritized R&D and innovations	
Foster innovation Public- Private Partnerships (PPP) by leveraging the expertise and market knowledge of the private sectors.			
Develop policies and/or guidelines to ensure efficiency, timeliness, and transparency of the procurement process (Sec. 26 of RA 11293)			

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD		
Establish an agile regul services at the early sta	Establish an agile regulatory standard designed for innovative products and services at the early stage of development/business				
Develop a framework and priority plan for innovative technologies, products, and services that will be subjected to regulatory sandboxes	Develop policies, guidelines, and requirements for the issuance of licenses to startups or MSMEs with innovative products and services for participation in regulatory sandboxes	Review of policies to make regulations responsive to the challenges and concerns on emerging and disruptive technologies based on the findings from the regulatory sandboxes			
	Utilize existing technologies to facilitate ease of regulating new startups or MSMEs with innovative products and services		DTI, DOST, DICT, DOF		
Review and identify existing regulatory processes and technologies that can reduce barriers to entry for industry stakeholders	Streamline regulatory processes and utilize technologies (e.g., regulatory technologies) to reduce barriers to entry for industry stakeholders (investors, employees, customers)	Strengthen the investor engagements with regulatory bodies for enhanced adoption and technology transfer of regulatory technologies			

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Implement reforms and transactions within the	d formulate guidelines tl innovation ecosystem	nat will streamline variou	IS
Conduct scoping studies that will identify legal and institutional barriers to innovation (Sec. 24)	Draft policies that simplify and clarify regulations to reduce red tape in innovation-related transactions.	Conduct a regular Regulatory Impact Assessment* (RIA) to ensure that new processes and policies are responsive and adaptable to emerging technologies and innovation trends	
Review and assess existing procurement guidelines that causes delay in publicly funded R&D, technology development, and innovation projects	Develop policies and/or guidelines to ensure efficiency, timeliness, and transparency of the procurement process (Sec. 26 of RA 11293)	Monitor and update procurement guidelines for smooth and highly prioritized R&D, technology development, and innovation projects	DTI, DICT, DILG, DOST, DBM, IPOPHL, Government Procurement Policy Board (GPPB), Philippine Government Electronic Procurement System (PhilGEPS), Anti-
Promote pre- commercialization procurement (PCP) by developing a forward- looking and demand – based procurement strategy for innovative solutions, especially for publicly funded R&D outputs and startups	Establish standards and procedures that will define the requirements for public procurement of innovative solutions (PPI), such as conformance testing and open/negotiated procedures	Assessment and updating of pre-commercial procurement guidelines/toolkits and policies geared towards innovation procurement and changing market demand behavior	Red Tape Authority (ARTA)

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Enact policies that will for innovations	improve competition, bu	usiness, and regulatory o	environment
Ensure the adoption of IP management policies to facilitate the commercialization of technologies and public good generated by public and private R&D institutions and the academe	Review and streamline procedures for the protection of intellectual property of innovations from MSMEs, and businesses, including traditional cultural expressions (TCE) and traditional knowledge (TK) from grassroots communities	Strengthen policies that will enable MSMEs to avail technical assistance for intellectual property (IP) registration of their innovations	
Review regulatory frameworks that may promote or inhibit innovation and monopolistic positions in markets (i.e., use of AI)	Initiate regulatory reforms for ICT infrastructure to enable a conducive environment for competition, especially in the telecommunication sector	Strengthen the promotion of fair regulatory reforms that support cutting-edge digital solutions and prolonged capability enhancement for a competitively advanced digital economy	NEDA, Philippine Competition Commission (PCC), DTI, DOST, IPOPHL
Foster Innovation Public- Private Partnerships (PPP): Encourage collaboration between the government and private sector to drive innovation by leveraging the expertise, resources, and market knowledge of private sector entities			

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Align education and hu current industry and er	uman capital developme merging market demand	ent programs with the ne ds	eeds of the
Strengthen the implementation and ensure alignment of education reforms with the Philippine Skills Framework (PSF)	Develop an Industry 4.0 skills framework and update career pathways for R&D, technology, and innovation, including IP professionalization, to align with the demands of emerging and evolving jobs	Review and update existing workplace management, policies, and practices for continued job quality improvement and lifelong learning of all talent ages	
Revisit constitutional provision on engaging foreign teaching professionals in the country to attract highly talented professionals and contribute to improving the talent pool in the country	Increase and standardize invitations and engagements for experts to speak and teach at schools in rural and urban areas	Ensure equitable distribution of qualified R&D experts and supervisors nationwide for continued talent pool formation in the regions	Department of Education (DepEd), Commission on Higher Education (CHED), DTI, Technical Education and Skills Development Authority (TESDA), DA, Department of Tourism (DOT), Department of Labor and Employment (DOLE), DOST
Review university Key Performance Indicators (KPI) to encourage researchers and educators to commercialize their R&D outputs as a basis for merit and promotion system	Provide measures and avenues that will link and engage researchers with viable pre- commercialization innovations to possible investors for financing support and with ensured IP protection	Sustain research and funding support for continued improvement of innovative goods, products, and services	

III. Innovation Infrastructure

THE GENERAL OBJECTIVES ARE TO:



Design, establish, and upgrade physical and digital R&D technology and innovation infrastructure and standards

to support innovation actors in transforming their ideas into innovative products and services



Provide and manage resources

such as knowledge products that increase/encourage lifelong learning of innovation actors in the public and private sectors



SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Design, establish, and infrastructure and stan their ideas into innova	upgrade physical and d dards to support innova tive products and servic	igital R&D technology a tion actors transform in es	nd innovation transforming
Develop standards for the establishment and registration of innovation hubs in strategic locations (e.g., level 1, 2, 3)	Establish or upgrade physical innovation infrastructures and facilities, specifically Science and Technology (S&T) parks, innovation centers (i.e., Regional Inclusive Innovation Centers) and hubs, business incubators, and R&D laboratories and facilities and accelerators with cutting-edge technology equipment, in strategic locations	Expand, maintain, and continuously upgrade innovation infrastructures and facilities across all regions to keep up with emerging technologies, and remain at par with international standards	DOST, Department of
Map, determine, and develop necessary ICT infrastructure and base resources across the country, especially in geographically isolated and disadvantaged areas (e.g., e-libraries, e-learning platform content, subscription to applications and websites, etc.) in consultation with the PSAC	Establish and improve accessibility of ICT infrastructure and digital platforms, especially in remote and underserved areas (e.g., e-libraries, e- learning platform content, subscription to applications and websites, etc.)	Monitor, maintain reliability, and continuously upgrade ICT infrastructure across the country	Public Works and Highways (DPWH), DTI- Philippine Economic Zone Authority (DTI- PEZA), DICT, PhilSA In consultation with the Private Sector Advisory Group (PSAC)
Identify relevant and existing information systems on data storing, processing, and open access sharing among the industry, academe, and government while ensuring safety and security through cybersecurity measures	Establish a digital and interoperable data-sharing system with integrated surveillance and cybersecurity among the industry, academe and government	Strengthen and maintain information systems for data sharing while continuously strengthening surveillance and cybersecurity measures in place among the industry, academe, and government	

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Provide and manage resources such as knowledge products that increase/encourage lifelong learning of innovation actors in the public and private sectors			
Map and assess existing databases on R&D, technology development and innovation initiatives, and training and certification	Establish a harmonized open-access database in support of R&D, technology development and innovation initiatives, and continuous learning through training and certifications	Update and maintain, and improve (as necessary) the databases	
Identify relevant and existing innovation skill sets and knowledge products for integration into the e- learning platform	Establish an e-learning platform (Filipinnovators website) to provide necessary training and certifications, access to other market information	Maintain and update the content of the e-learning platform	DICT, DepEd, CHED, TESDA
Develop content as a base resource for knowledge products and publications in the creation of an e- library in consultation with relevant public and private stakeholders	Establish a comprehensive and open-access e-library to guarantee public access to essential knowledge products and publications	Maintain and continuously enhance the e-library with an emphasis on open and reliable access	
Provide access to adequate subscription-based applications and websites with relevance to innovative products and materials	Maintain and update existing with relevance to the innovat	I and future subscriptions still ion needs of the country	

Innovation Financing

THE GENERAL OBJECTIVES ARE TO:



Develop a holistic financing program for innovation



Stimulate private sector and international funding and support for research and development, technology, and innovation-related programs, activities, and projects (PAPs)



SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD	
Develop a holistic finar	Develop a holistic financing program for innovation			
Map, consolidate and streamline existing government funding support from ideation to commercialization, growth, and expansion (e.g., Science for Change Program - Collaborative Research and Development to Leverage Philippine Economy [S4CP-CRADLE], S4CP-Niche Centers in the Regions for R&D [NICER], Startup Grant Fund, Startup Venture Fund, Innovation Fund/Grants, among others)	Design and implement a consolidated innovation financing program across government agencies, which supports ideation to commercialization, growth and expansion	Review and monitor the innovation financing program, keeping it up to date on industry trends, stakeholder demands, and government capability		
Improve access to capital for innovative startups and enterprises through dedicated venture capital funds, encouraging angel investor networks, and promoting crowdfunding platforms			NEDA, DBM, Bangko Sentral ng Pilipinas (BSP)	
 Fast track the implementation of innovation fund-related policies under the Philippine Innovation Act through the development of the guidelines for: Section 21. Innovation Fund (National Revolving Fund, Innovation Grants/Vouchers, and Bi/Multilateral Funds) Section 22. Innovation Development Credit and Financing Program; and Section 23. Credit Quota for Innovation Development 	Strengthen the implementation of innovation fund-related policies (i.e., innovation voucher, equity financing, etc.) for MSMEs	Establish LGUs revolving fund for innovations		

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Facilitate benchmarking studies with other countries to develop the framework for Intellectual Property (IP)- Backed Financing	Develop policies/guidelines for the valuation of IP in support of the implementation of the Personal Property Security Act in preparation for IP- Backed Financing	Capacitate and monitor financial institutions, private sectors, and relevant stakeholders in the implementation of the mechanism for IP-Backed Financing	
Support the implementation of the Startup Grant Fund and Startup Venture Fund	Strengthen the implementation of the Startup Grant Fund and Startup Venture Fund	Review, monitor, and evaluate the implementation of the Startup Grant Fund and Startup Venture Fund	

Stimulate private sector and international funding and support for research and development, technology, and innovation-related programs, activities, and projects (PAP)

Promote and strengthen R&D tax incentive schemes	Establish a centralized and accessible database and information system that consolidates information on all government-funded innovation-related programs, activities, and projects (including funding status) to show the performance of innovators being funded for transparency and boost investor's confidence	Encourage and leverage private sector funding and support (later-stage funding, i.e., for scaling up) for innovative startups and MSMEs through debt/equity financing, as well as through public-private partnerships	
Map potential local and foreign partners for funding and investment in innovations	Establish a market information sharing platform to help match innovation ecosystem actors for funding and investments, and Research and Development demands and outputs.	Establish public-private supported crowdfunding platforms to support MSMEs, Startups, etc.	DOST, DTI, BSP, DBM, DOF, NEDA, Commission on Audit (COA)
	Proactively promote and secure funding through science, technology, and innovation (STI) diplomacy and joint investment activities and increase access to international missions/bilateral/multilater al funds to support innovative projects and activities		

V. Innovation Programs

THE GENERAL OBJECTIVES ARE TO:



Strengthen innovation culture

and inculcate required knowledge, skills, competencies, and character qualities to innovate starting from the early stages of life



Accelerate academe-industry-government collaboration

(triple helix model of innovation) in establishing innovation alliances, incubation and accelerator programs, and market-driven R&D ventures



Promote continuous and lifelong learning to foster and sustain innovation abreast wit latest industry trends and needs



SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD	
Strengthen innovation culture, and inculcate the required knowledge, skills, competencies and character qualities to innovate starting from the early stages of life				
Cultivate research and development, and extension skills (e.g., science congress etc.) by developing knowledge products and conducting educational caravans on innovation and entrepreneurship in schools.	Initiate reforms in the existing curriculum that will promote pedagogies to develop 21st- century skills, competencies and character qualities including through design thinking workshops, flipped classroom models, and experiential learning, among others	Evaluate and scale up curriculum geared toward promoting market-driven and market-oriented innovations		
	that will incentivize students in data collection, especially primary data for thesis/research			
Encourage student participation in school-based competitions and activities that promote innovation and entrepreneurship such as hackathons and business model pitching.	Foster partnerships between the academe, civic organizations and private companies to promote innovation in their project or Corporate Social Responsibility	Monitor and evaluate the progress and impact of innovation initiatives among students (number of innovative projects, patents filed, or successful	Lead agency for each priority	
	Boost implementation of youth programs promoting technopreneurship to increase youth's interest in STI and entrepreneurship	commercialization of student innovations)	sector; NIC	
Capacitate and encourage teachers and educators to initiate innovation-related activities through the conduct of innovation training programs and the establishment of the Diaspora for Innovation and Development Program, a platform where high-level Filipino experts share their innovation journey and mentor educators	Foster collaboration with the private sector and educational institutions to assist educators in innovation-related learning activities and events Increase international joint knowledge and technology transfers, benchmarking activities, and study missions to increase the capacity and global competitiveness of teachers, educators, and budding student entrepreneurs	Monitor and evaluate school-led innovation- related events and activities		

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD	
Accelerate academe-industry-government collaboration (triple helix model of innovation) in establishing innovation alliances, incubation and accelerator programs, and market-driven R&D ventures.				
Expand the scope of the National Innovation Day (NID) celebration by incorporating regional and local events that will foster collaboration among various innovation actors and showcasing innovative practices from different sectors	Establish a sustainable framework for the National Innovation celebration, which can include securing long-term partnerships and funding support with academia, industry associations, and international organizations	Evaluate the impacts of the NID celebrations and establish an award-giving body recognizing ideal innovation initiatives, best practices for innovation, and successful collaborative innovation projects		
Map and identify the local incubation and accelerator hubs for startups and MSMEs	Intensify Incubation and accelerator programs, and market-driven R&D ventures through targeted and comprehensive support systems for innovative startups and entrepreneurs Incentivize businesses to partner with schools, colleges and universities in creating incubation hubs, accelerator programs, and research and development centers	Evaluate and strengthen incubation and acceleration programs, market-driven R&D ventures, and access to funding	Lead agency for each priority sector; NIC	
Encourage the private sector to engage in collaborative innovations and research projects, technology transfer initiatives, and mentorship programs to promote the exchange of expertise and resources.	Encourage the private sector to establish innovation programs including dedicated R&D innovation labs, and partnerships with universities and startups to support the ecosystem.			
Cascade national programs for networking and R&D collaborations, market access, mentoring and networking through the RRDICs and RIICs	Link and assist regional innovations to mentorship, networking opportunities, and funding programs at the national and international level	Evaluate and identify best practices for regional networking that shall serve as a basis for the development of standardized processes for collaborative, innovative projects and programs		

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Capacitate technology transfer and business development offices (TTBDO) and Innovation and Technology Support Offices (ITSO) for identifying technologies and local innovations, including public goods that will be prioritized for commercialization or based on current consumer trends and market needs and opportunities.	Intensify technology transfer events and commercialization activities through reverse pitching and design thinking events Assist innovators in facilitating technology transfer transactions and collaborative R&D projects through the support programs of TTBDOs and ITSOs Establish collaborative platforms and networks between educational institutions, industry, government, and research organizations to foster co- creation and collaborative innovation initiatives.	Evaluate and monitor technology transfer transactions generated from reverse pitching and design thinking events and realign priorities as deemed necessary	
Develop a program (site visits, internships, and collaboration on joint projects) to provide innovation stakeholders with exposure to Research and Development Institutions	Establish a funding program for collaborative R&D projects between industry, academia and government institutions Create a framework for long-term collaboration between industry, academia and government institutions	Monitor and evaluate the collaboration among industry, academe and government institutions towards the achievement of the innovation goals	Lead agency for each priority sector; NIC
Proactively promote science, technology, and innovation (STI) diplomacy and joint investment activities and increase access to international missions/bilateral/ multilateral funds to support innovative projects and activities	Strengthen international market intelligence of foreign service officers by mapping the needs and niches of the international community	Strengthen cross-border collaboration, alliances and market access, through STI diplomacy, and form network with more advanced countries	

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD
Establish an innovative startup development program to provide mentoring, funding, and infrastructure support to MSMEs, entities and individual entrepreneurs developing an innovative product, process or business model	Develop an industry- academe-led startup mentorship program that will enable innovative MSMEs and entrepreneurs to secure seed funding	Strengthen targeted support for MSMEs to assist their development to larger- sized and more productive firms	
Establish a program for engagement of stakeholders (e.g., professional organizations, civil society organizations) to strengthen social marketing and social mobilization. • Maximize traditional/social media campaigns to develop a sense of belongingness to the innovation ecosystem and develop a pool of "influencers" that will echo the innovation agenda	 Support creative industries that feature innovation in their content Development of a comprehensive social media strategy that focuses on building an online community around innovation. This could also include creating social media channels or platforms. Engage influencers to amplify the reach and impact of social media campaigns. 	Continuously monitor and analyze social media trends and platforms to adopt the social media strategy • Establish a social media ambassador program, where influencers within the innovation ecosystem can actively promote and advocate for innovation	Lead agency for each priority sector; NIC

SHORT-TERM (2023-2024)	MEDIUM-TERM (2025-2027)	LONG-TERM (2028-2032)	LEAD	
Promote continuous a with the latest industry	Promote continuous and lifelong learning to foster and sustain innovation abreast with the latest industry trends and needs			
Develop materials, and conduct training and skills development programs that will increase the "absorptive capacity" and lifelong learning of champions in the public and private sectors Implement support programs to encourage and incentivize content creators for lifelong learning and digital upskilling and reskilling courses	Establish and implement online and physical programs that will enable continuous learning across all regions and promote the utilization of emerging technologies.	Mainstream the utilization of Extended Realities (Augmented and Virtual Realities) in learning, reskilling, and upskilling programs		
Develop exchange programs between industry professionals and students, and conduct annual R&D conferences on market trends to align the needs of the industry with the capacities and initiatives of the academe and RDIs	Establish information systems for sharing of market and customer analytics among the government, industry and academe through a digital marketplace where innovative entrepreneurs can showcase their products and services, with tools that analyze consumer trends and industry needs	Institutionalize the use of digital marketplace and information systems in developing R&D agenda that is aligned with consumer trends and industry needs	Lead agency for each priority sector; NIC	
	Provide support for the adoption of intelligent tools and analytics for evidence- based, data-driven, and inclusive approaches in formulating and assessing policies and strategies	Integrate innovation/innovative behavior or skills in the developing professional standards and qualification for employment in public and private institutions.		
CHAPTER 4

INNOVATION PRIORITY AREAS



The National Innovation Agenda Framework

The National Innovation Agenda subscribes to the *AmBisyon Natin* 2040: *matatag, maginhawa, at panatag na buhay* as the preferred future. Amid various challenges–present and future, both anticipated and unanticipated--the key to achieving the *AmBisyon Natin* 2040 is to transform the country into a Smart and Innovative Philippines. This involves having: (a) a proactive, smart, and innovative people; (b) a competitive and resilient economy; (c) collaborative and reliable institutions; and (d) an efficient, clean, and sustainable environment (Figure 7).



Figure 7. National Innovation Agenda Framework

This first NIASD outlines the strategies to establish a dynamic innovation ecosystem, with the government driving the agenda.

Government action will put in place the enabling conditions: efficient and competent governing bodies, responsive policies, appropriate infrastructure, effective programs, and adequate financing support. The innovation enablers and corresponding strategies that were discussed in Chapter 3 are intended to encourage innovations in all sectors. For the period 2023-2032, emphasis will be given to 10 sectors. These sectors have faced severe challenges brought about by the COVID-19 pandemic and the resulting restrictions on economic and social activities. Moreover, various indicators suggest that these sectors are ready for change. More importantly, certain domestic and external developments may influence these changes in an undesirable way unless they are properly governed to ensure they lead to the future we want and not to the future we do not want.

The following are the priority sectors of the NIASD 2023-2032 and the agencies that will be responsible (highlighted) for promoting innovation in the sector is also given:

A. Pro-active, Smart, and Innovative People

Learning and Education
RESPONSIBLE AGENCIES
CHED (Lead) DOLE DILG DTI
DepEd DOST IPOPHL TESDA

Health and Well-Being
RESPONSIBLE AGENCIES
DOH (Lead) DOST DILG

B. Competitive and Resilient Economy

Food and Agribusiness
RESPONSIBLE AGENCIES
DOST (Lead) DA DTI FDA
NNC DILG IPOPHL
Finance
RESPONSIBLE AGENCIES
KEST ONSIDEL AGENCIES
BSP (Lead) DBM NEDA DTI

Manufacturing and Trade
RESPONSIBLE AGENCIES
DTI (Lead) IPOPHL DOST
DENR DILG DOLE

Transportation and Logistics
RESPONSIBLE AGENCIES
DOTr (Lead) DTI DOST
DOE DPWH DICT

C. Collaborative and Reliable Institutions

Public Administration
RESPONSIBLE AGENCIES
DICT (Lead) NEDA DBM
DILG CSC DOLE

Security and Defense
RESPONSIBLE AGENCIES
DND (Lead) DILG DFA DOST

D. Efficient, Clean, and Sustainable Environment

Energy
RESPONSIBLE AGENCIES
DOE (Lead) DENR DOST

Blue Economy and Water
RESPONSIBLE AGENCIES DENR (Lead) DILG DTI DOE

For each priority sector, the following strategies will be implemented alongside the cross-cutting strategies listed in Chapter 3.



• Propose a policy reform agenda that will encourage innovation in the sector

Infrastructure

- Facilitate access to innovation infrastructure for the innovation actors in the sector
- Recommend to the NIC Secretariat mentors that can assist innovation actors in the sector

🗓 Programs

- Propose programs that will create awareness of the innovation process among stakeholders in the sector
- Propose programs that will generate knowledge and manage knowledge stocks that may be relevant to the sector
- Propose programs that will produce a pool of innovators in the sector, for instance, through graduate and postgraduate scholarship, thesis and research grants, etc.

🕈 Financing

- Propose an Innovation Program Convergence Budget for the sector, to be submitted to the NIC Secretariat for the review and approval of the NIC
- Encourage other sources of funding support for innovation in the sector

Horizon Scanning

Horizon scanning¹¹ and futures thinking play a crucial role in innovation planning by enabling organizations to anticipate and adapt to the ever-changing landscape of the market. In an era characterized by rapid technological advancements, shifting market dynamics, and emerging global challenges, businesses need to proactively identify opportunities and risks on the horizon. By applying and using horizon scanning in the innovation planning process, we can proactively prepare for opportunities and challenges, and stay ahead in a dynamic world.



In the subsequent section, the objectives and scope of innovation for each sector are defined. The observed signals and drivers of change are enumerated. Some of the innovations desired within this period (2023-2032) are also provided—the so-called "Headline in 2032" or what a historian living beyond 2032 will discover as an artifact that would have existed during this period.

¹¹ Delaney, K. (2014). Innovation Tool Kit: A practical guide: Introduction to horizon scanning in the public sector I OECD–OPSI, 2014 accessed through Innovation toolkit (apo.org.au).

PILLAR ONE

Pro-active, Smart, and Innovative People

By 2032, Filipinos are lifelong learners and demonstrate highvalue 21st century skills with high regard for the quality of life, inclusive work and entrepreneurship opportunities, continuous human capital development, innovative thinking, R&D, and use of IP and intangible assets for development.



Learning and Education

Innovations that enable the effective delivery of inclusive and quality lifelong learning, allowing learners to acquire functional literacy, knowledge, skills, values, beliefs, and habits toward a more proactive, productive, smart, and innovative people. These include improving the teaching and learning environment, learning equipment and platforms, continuing professional and learning development, curriculum design, and pedagogy, among others.

2032

$\otimes \bigcirc \odot$ Signals

- Adoption of online, distant and open learning setup (Massive free open online education courses and resources for public learning)
- Integration of mixed reality technologies in education
- Emergence of personalized learning (e.g., phenomenon-based learning)
- Demand for 21st century skills
- Utilization of AI power-based tools and innovative pedagogies for teaching and learning (e.g., immersive gamification, blended learning, computational thinking)
- Popularity of edutainment in online platforms (i.e. YouTube, Facebook, TikTok)

Headline for 2032

Students from Panatag Elementary School Collaborate with Their Peers From Finland



Learning and Education

$\otimes \bigcirc \odot$ Drivers

- Demographic trends
- Changing nature of work
- Advances in technology
- Extreme weather conditions and climate change

Box 1. 21st Century Skills, Competencies and Character Qualities

As defined UNESCO International Bureau of Education (2013) which is adapted from Lai & Viering (2012) refers to the 21st century skills as overarching knowledge, skills and attitude learners and workers need to be able to fully participate and contribute to the knowledge society spurred forward by the increasing importance of conceptual and metacognitive knowledge.

Following DepEd's 21st Century Skills Framework (2019) and TESDA Competency Standards (2018), the competencies and character qualities for a learner to succeed in the 21st century shall be under the following four domains:

- Information, Media, and Technology Skills. (i.e., visual literacy, information literacy, media literacy, technology literacy, digital literacy)
- Learning and Innovation Skills. (i.e., Creativity, Openness, Critical Thinking, Problem Solving, Reflective Thinking)
- Communication Skills. (i.e., Teamwork, Collaboration, Interpersonal Skills, Intrapersonal Skills, Interactive Communication, Non-verbal Communication, Communicating in Diverse Environments)
- Lifelong Learning and Career Skills. (i.e., Informed Decision-Making, Adaptive Leadership, Intercultural Understanding, Self-discipline and management, Future Orientation, Resilience and Adversity Management)

2 Health and Well-Being

Innovations that ensure affordable, smart, equitable, quality, responsive, accessible, and comprehensive healthcare, and total well-being services, products, and solutions. These include engaging individuals and groups in informed health decisions, enabling their participation in decisions affecting their health, averting health risks, reducing barriers to healthcare services, and protecting them from the consequences of ill health. The aim is to promote and improve health outcomes for all Filipinos.



$\otimes \bigcirc \odot$ Signals

- Adoption of smart technologies for personalized health information and monitoring (e.g., use of medical wearables, telemedicine, digital twin)
- Proliferation of edutainment in health and wellness
- Growing global recognition of Filipino scientists
- Utilization of quantum computing in drug research and development
- Emergence of potentially harmful pathogens and microbes from melting glaciers

$\otimes \bigcirc \odot$ Drivers

- Technological advances in healthcare
- Healthcare cost
- Population health condition (physical and mental health)
- New zoonotic diseases and pandemic
- Health workforce migration

Headline for 2032

Health and Well-Being

Filipino Scientist Chairs the WHO Strategic Advisory Group of Experts (SAGE)



PILLAR TWO

Competitive and Resilient Economy

By 2032, the Philippine economy is robust, globally connected, competitive, and agile—providing equal opportunities for all through strong and collaborative innovation and entrepreneurship ecosystems.



Food and Agribusiness

Innovations on interconnected value chains, including agricultural extension and support services, in food, agriculture, forestry, fisheries, and other related industries. These innovations aim to ensure food security and proper nutrition that is affordable, accessible to communities, and sustainable while empowering local producers. These include smart agricultural inputs, improving production efficiency and mechanization, cost-effective postharvest handling, processing, logistics, marketing, distribution, and consumption of agribusiness products and services.

$\otimes \bigcirc \odot$ Signals

- Disruptions in the food supply due to the ongoing Russia-Ukraine conflict and pandemic
- Development of climate resilient and new crop
 protection technologies
- Adoption of technologies for improving storage and lengthening the shelf life of agri-food products
- Use of solar-powered cold storage facilities to improve food supply chains
- Utilization of 4IR and IoT technologies for agrifood production processes
- Increasing demand for organic, naturally grown, or plant-based agri-food products
- Use of digital platforms in the marketing of agrifood products

$\otimes \bigcirc \odot$ Drivers

- Climate change and natural hazards
- Consumer demand and preferences
- Infrastructure and urban development
- Urban migration
- Population growth
- Land use policy

Headline for 2032

Food and Agribusiness

PH Donated CODESAFE Food Packs to Tsunami-hit Village in ABC Country







Innovations that facilitate smart, inclusive, interoperable, efficient, and secure financial services. These include innovative platforms for financial literacy and advisory, innovations in digital and open finance, data-driven financial solutions, and cross-border innovations in financial products and services.



$\otimes \bigcirc \odot$ Signals

- Growing interest in decentralized finance
 and cryptocurrency
- Shifting prioritization of Fintech companies to the Environmental, Social, and Governance (ESG) agenda
- Increasing usage of cloud computing technology by banks
- Increased collaborations between universities and banks

$\otimes \bigcirc \odot$ Drivers

- Financial regulatory frameworks
- Technologies for digital banking
- Cybersecurity
- Digital transformation in financial services
- Micro and sustainable finance
- Fintech revolution

Headline for 2032

2032

E-walletPH now accepted for EFTPOS transactions in over 100 Countries



Manufacturing and Trade

Innovations that enable more efficient, demand-driven, smart, sustainable, fully integrated, and agile processes in the manufacturing, buying, and selling of goods and services. These include end-to-end innovations from the demand and supply chains and sustainable manufacturing processes. Trade covers the creation of digital products, retail services, marketplace services, mobile commerce, creative goods and services, and customer service with quality assurance systems that ensure the compliance of the country's products and services to international standards.

$\otimes \bigcirc \odot$ Signals

- Rise of e-commerce platforms
- Preference shift to digital shopping experience
- Adoption of additive manufacturing and Industry 4.0 technologies
- Demand for skills and capabilities for digitalization, data analytics, and programming
- The rise of AI and chatbots
- Design and commercialization of sustainable and organic packaging
- Adoption of digital tools by MSMEs to support and expand business operations
- Industrial transformation in manufacturing including high-speed and high-capacity computing for trade and business information
- Use of cloud services and infrastructure migration for process automation and digital transformation

$\otimes \bigcirc \odot$ Drivers

- Fourth and fifth industrial revolution (FIRe and 5IR)
- Technological advancements for automation
- Changing consumer preferences
- Government regulations for public services
- Foreign investments in the country
- Tech-savvy population
- Access to internet
- Geopolitical tensions that may disrupt global supply chains
- Shifting job requirements due to automation of labor-intensive production operations.

Headline for 2032

Manufacturing and Trade

PH Microchip Exports Commended for Using Sustainable Packing Material from Seaweed





6 Transportation and Logistics

Innovations that ensure efficient, seamless, inclusive, safe, and secure physical movement or mobility of the flow of goods and people while ensuring equitable mobility opportunities through better urban-rural linkages and reducing carbon footprint in the sector. These include innovations in the public and private transportation and mobility systems that facilitate the adoption of responsive, efficient and low-carbon land, water and air transport systems; enhancements in land use and transport interaction in urban planning; and logistics management, warehousing, and storage, among others.



$\otimes \bigcirc \odot$ Signals

- Promotion of agricultural logistics innovation to reduce food prices
- Use of AI and IoT in predicting traffic flows, and in automating freight/logistics operations
- Shift to multimodal, alternative, and eco-friendly transportation (e.g. e-vehicles, e-bikes/scooters)
- Use of big data, blockchain, and cloud-based for traffic management
- Adoption of autonomous vehicles and systems (e.g., drone deliveries, self-driving cars)

Headline for 2032

Multimodal Transport and Mobility Systems Now Operational in Major Cities in the Philippines

$\otimes \bigcirc \odot$ Drivers

- Alternative energy sources for transportation
- Budget allocation for transport and road infrastructure programs
- Cost of fuel and transportation
- Traffic congestion in Metro Manila
- Urbanization



PILLAR THREE

Collaborative and Reliable Institutions

By 2032, Philippine institutions are highly accountable, collaborative, and interconnected, strengthening innovation efforts towards smart, efficient and improved services that are people-centered, participatory, transparent, trustworthy, safe and secure.





Innovations that empower participatory governance to ensure collaborative, people-centered, reliable, accountable, and efficient government institutions. These include enhancements and integration of innovation and anticipatory policy planning, citizen participation, administration of justice, digital transformation and e-governance, transparency, public procurement, government-to-government collaboration, and improvement of public service delivery of NGAs and LGUs, among others.



$\otimes \bigcirc \odot$ Signals

- Tremendous increase in internet use and establishment of cell towers in the Philippines
- Adoption of e-governance, AI, cloud-based, and interoperable processes in the government
- LGUs' move toward digitalization (e.g., online tax payment, AI chatbots for customer feedbacks)
- Occurrence of cyberattack attempts on Philippine digital platforms
- Adoption of Philippine Government's Cloud First
 Policy
- Digital transformation in government

Headline for 2032

Public Administration

Philippines Now Ranks in the Top 1/3 in the E-government Development Index (EGDI)

$\otimes \bigcirc \odot$ Drivers

- Technological advancements and internet connectivity in unreached areas
- Cybersecurity conditions



B Security and Defense

Innovations that protect and secure national territory and sovereignty, support peace and development efforts, maintain public order and safety, and build the capacities of people and institutions to respond to natural and human-induced hazards. These include improvements in law enforcement, cybersecurity, public health security, disaster response and relief, peace and development interventions, defense capabilities and materiel of the Armed Forces, and maritime and air domain awareness monitoring, among others.

$\otimes \bigcirc \odot$ Signals

- Adoption of new technologies, including use of extended reality (augmented reality and virtual reality) during military planning and simulation training exercises
- Utilization of new technologies such as rescue drones, AI, data analytics, geospatial technology, big data, and digital twin on DRR response and monitoring
- Utilization of Internet of things capability in the military
- Use of satellite-based domain awareness that tracks objects in space and predicts potential threats.
- Heightened citizen awareness against fake news, online fraud, and cybersecurity

$\otimes \bigcirc \odot$ Drivers

- Military, defense, and government digitalization
- Territorial conflicts and geopolitical tensions
- Climate or human-induced hazards
- Emergence of war, pandemic and diseases

Headline for 2032

Security and Defense

Local Companies Flock to Manufacture Defense Assets for DND





PILLAR FOUR

Efficient, Clean, and Sustainable Environment

By 2032, our environment, natural, and energy resources are sustainably used for optimum productivity levels, without compromising balanced and healthful ecology for the present and future generations.





Innovations towards achieving energy security in the country while ensuring efficient, clean, and sustainable extraction, production, refinery, processing, distribution, sale, and consumption of energy resources. These include those for improving energy access, promoting cost-effective and renewable energy sources, mainstreaming energy efficiency and conservation, and accelerating the transition towards clean and sustainable energy.



$\otimes \bigcirc \odot$ Signals

- Increasing customer awareness on environmental regulations and consumption
- Expansion of energy sources to include nuclear power and other emerging energy fuels and technologies.
- Increased deployment/use of electric vehicles and renewable energy equipment (e.g., rooftop solar panels)
- Shift in energy demand and supply to bring power to unserved and underserved areas

Headline for 2032

2032

Energy

PH, One of the Fastest Growing RE-powered Nations in the ASEAN Region

$\otimes \bigcirc \odot$ Drivers

- Climate Change
- Consumer demands
- Green Regulations (e.g., sustainable development in trade policies, modified carbon pricing instruments)
- War and geopolitical tensions



Blue Economy and Water

Innovations that sustainably harness coastal, marine, and inland water resources to support economic growth, and generate sustainable livelihoods and jobs while preserving aquatic ecosystems. These include sustainable fish and marine-based industries, green maritime transport, sustainable tourism, ocean energy, sustainable management of freshwater resources, protection of marine ecosystems, marine scientific research, and improvement of water quality for various intended uses such as food production, recreation and sanitation.



$\overline{\otimes \bigcirc}$ \odot Signals

- Adoption of autonomous ship technologies
- Utilization of underwater acoustics imaging technology in regional resource mapping
- Continual rehabilitation of polluted ecosystem (e.g., mining-affected areas, coastal oil spill rehab, etc.)

$\otimes \bigcirc \odot$ Drivers

- Advances in ocean and water technology
- Demand for water resources, and ocean goods and services
- Globalization including global tourism

Headline for 2032

Blue Economy and Water

Department of Water Promotes Smart Water Management to Ensure water Security



CHAPTER 5

NIASD CORE TARGETS



NIASD CORE TARGETS

Table 4 shows the core targets of the NIASD proposed for 2032 and 2040. Several indicators have already been included in the PDP 2023-2028, given that innovation is considered as a major transformation strategy in the PDP. The table also includes the end-of-plan (EOP) targets for these indicators. The 2032 and 2040 targets align closely with the innovation performance of regional innovation leaders.

GII Sub-Indices/Indicator	Baseline (2022)	2028	2032*	2040*
Overall GII ranking	59th	43rd	34th	25th
GII score	30.7	35	41	47
 1. Institutions 1.2.1 Regulatory Quality (rank) 1.3.1 Policies for doing business (rank) 	72	53	49	40
	96	76*	66	43
 2. Human Capital and Research ◆ 2.3.1 Researchers, FTE/mn pop. ◆ 2.3.2 Gross expenditure on R&D, % GDP 	174 (2018)	500	1,000	1,500
	0.32 (2018)	1.0	1.6	1.8
3. Infrastructure 3.1.1 ICT access (rank) 3.1.2 ICT use (rank)	100 95	71* 71*	53 53	40 40
 4. Market Sophistication 4.1.1 Finance for startups and scaleups^a 4.2.2 Number of venture capital deals invested in (per billion PPP\$ GDP, three-year average) 	0 (2021)	3*	5	7
	0 (2021)	0.1*	0.2	0.3
 5. Business Sophistication 5.1.2 Firms offering formal training, % 5.2.1 University-industry R&D collaboration^b 5.3.4 FDI net inflows, % GDP 	59.8	75	80	85
	3.7	4	4.5	6
	2.7 (2021)	2-5	6-8	9-12

Table 4. NIASD Core Targets

* Proposed targets

 \bullet GII Indicators that are monitored in the PDP 2023-2028

^a Five-year average perception scores (1=completely false; 10 = completely true)

^b Average perception scores [1 = not at all; 7 = to a great extent]

GII Sub-Indices/Indicator	Baseline (2022)	2028	2032*	2040*
Overall GII ranking	59th	43rd	34th	25th
GII score	30.7	35	41	47
 6. Knowledge and Technology Outputs 6.1.1 Patents by origin/bn PPP\$ GDP^c 6.1.3 Utility models by origin/bn PPP\$ GDP^d 6.2.2 New businesses/th pop. 6.2.5 High-tech manufacturing, % total manufacturing output 6.3.3 High-tech exports, % total trade 	0.5 0 0.2 38.7 39.7	1.0* 0.5* 1.3 45* 46.9	2.0 0.7 1.5 50.0 50	4.0 1.0 4.0 60.0 55
 7. Creative Outputs 7.1.2 Trademark by Origin/bn PPP\$ GDP 7.1.3 Global Brand Value, top 5,000, %GDP 7.2.1 Cultural and Creative Export, % total trade 7.2.5 Creative Goods Export, % total trade 	33.6 41.8 0.1 6.3	40* 50* 2.0* 7.3*	48 62 3.0 8.0	68.0 78.0 4.0 10.0

* Proposed targets

• GII Indicators that are monitored in the PDP 2023-2028

^c Number of resident patent applications filed (per billion PPP\$ GDP)

^dNumber of resident utility model applications filed (per billion PPP\$ GDP)

ANNEX GII INDICATORS

The GII Conceptual Framework

The Innovation Index is comprised of two sub-indices: (1) Innovation Input Sub-Index, and (2) Innovation Output Sub-Index. Each of these sub-indices is built around pillars and defined as follows:

1) Innovation Input Sub-Index covers five input pillars that capture elements of the national economy that enable innovative activities, namely:

a) Institutions – refers to the institutional framework of a country that is conducive and nurturing innovation by providing good governance, and the correct levels of protection and incentives. This includes sub-pillars on the political environment, regulatory environment, and the business environment.

b) Human Capital and Research – refers to the level and standard of education and research activity in an economy, which are prime determinants of the innovation capacity of the nation. This includes sub-pillars on education, tertiary education, and R&D.

c) Infrastructure – refers to structures that facilitate the production and exchange of ideas, services, and goods, which also feeds into the innovation ecosystem. The sub-pillars include information and communication technologies, general infrastructure, and ecological sustainability.

d) Market Sophistication – refers to the availability of credit and an environment that supports investments, access to the international market, competition, and market scale, which are all critical for businesses to prosper and innovation to be encouraged. Its sub-pillars include credit, investment, and trade, competition, and market scales.

e) Business Sophistication – refers to an assessment of business sophistication on how conducive firms are to innovation activity in order to foster their productivity, competitiveness and innovation potential. The sub-pillars are the knowledge workers, innovation linkages, and knowledge absorption.

2) Innovation Output Sub-Index includes two pillars which are the result of innovative activities within the economy and include the following pillars:

a) Knowledge and Technology Outputs – refers to variables that are considered to be the outcome of inventions and/or innovations. The sub-pillars for knowledge and technology include knowledge creation, knowledge impact, and knowledge diffusion.

b) Creative Outputs – refers on outputs and activities that involves creativity such as trademark applications, industrial design application, cultural and creative service exports, etc. The sub-pillars are intangible assets, creative goods and services, and online creativity.

The overall GII score is the average of the input and output sub-indices.



Figure 8. Global Innovation Index (GII) Framework

Methodology

Each input and output pillar are divided into three sub-pillars, each of which is composed of individual indicators. In the GII 2022 Report, a total of 81 indicators were used and fall into three categories: (a) quantitative/objective/hard data (65 indicators); (b) composite indicators/index data (13 indicators); and (c) survey/qualitative/subjective/soft data (3 indicators). These indicators are collected from the official data of international organizations such as World Bank, United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Telecommunications Union (ITU), World Intellectual Property Organization (WIPO), International Monetary Fund (IMF), United Nations Industrial Development Organization (UNIDO), International Labour Organization (ILO), and World Economic Forum, among others.

For an economy to be featured in the GII 2022, the minimum symmetric data coverage requirement is at least 36 indicators in the Innovation Input Sub-Index (66 percent) and 18 indicators in the Innovation Output Sub-Index (66 percent), with scores for at least two sub-pillars per pillar. For purposes of transparency and replicability of results, missing values are not estimated; they are indicated with an "n/a" and are not considered in the sub-pillar score. Indicators with outliers that could polarize results and unduly bias were also treated and the 81 indicators were then normalized into the [0,100] range, with higher scores representing better outcomes.

Additionally, the following characteristics complicate the time-series analysis based on simple GII rankings or scores:

- **Missing values:** The GII produces relative index scores, which means that a missing value for one economy affects the index score of other economies. Because the number of missing values decreases every year, this problem reduces over time.
- **Reference year:** The data underlying the GII do not refer to a single year but to several years, depending on the latest available year for any given variable. In addition, the reference years for different variables are not the same for each economy due to measures that limit the number of missing data points.
- Normalization factor: Most GII variables are normalized using either GDP or population, with the intention of enabling cross-economy comparability. However, this implies that year-on-year changes in individual indicators may be driven either by the variable (numerator) or by its normalization factor (denominator).
- **Consistent data collection:** Measuring the change in year-on-year performance relies on the consistent collection of data over time. Changes in the definition of variables or in the data collection process could create movements in the rankings that are unrelated to performance.

A detailed economy study based on the GII database and the economy profile over time, coupled with analytical work on the ground, including that of innovation actors and decision-makers, yield the best results in terms of monitoring an economy's innovation performance and also in identifying possible avenues for improvement.

GII Pillars Sources and Definition

1 Institutions

1.1 Political Environment

1.1.2 Government Effectiveness

Government effectiveness index* | 2020

Index that reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Scores are standardized.

Source: World Bank, Worldwide Governance Indicators (http://info.worldbank.org/ governance/wgi). Data year: 2020.

1.2 Regulatory Environment

1.2.1 Regulatory Quality

Regulatory quality index* | 2020

Index that reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private-sector development. Scores are standardized.

2022 Source: World Bank, Worldwide Governance Indicators (http://info.worldbank.org/ governance/wgi). Data year: 2020.

2 Human and Capital Research

2.2 Tertiary Education

2.2.2 Graduates in science and engineering, %

Graduates from science, technology, engineering and mathematics programs (% of total tertiary graduates) | 2020

The share of all tertiary-level graduates in natural sciences, mathematics, statistics, information and technology, manufacturing, engineering and construction as a percentage of all tertiary-level graduates.

Source: UNESCO Institute for Statistics (UIS) online database (http://data.uis.unesco.org); Eurostat database (https://ec.europa.eu/eurostat/data/database); and OECD, Main Science and Technology Indicators (MSTI) database (https://stats.oecd.org/Index. aspx? DataSetCode=MSTI_PUB). Data years: 2015–2020.

2.3 Research and Development (R&D)

2.3.1 Researchers, FTE/mn pop.

Researchers, full-time equivalent (FTE) (per million population) | 2020

Researchers in R&D are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques, instrumentation, software or operational methods.

Source: UNESCO Institute for Statistics (UIS) online database (<u>http://data.uis.unesco.org</u>); Eurostat database (<u>https://ec.europa.eu/eurostat/data/database</u>); OECD, Main Science and Technology Indicators (MSTI) database (<u>https://stats.oecd.org/Index</u>. aspx? DataSetCode=MSTI_PUB); and Ibero-American and Inter-American Network of Science and Technology Indicators (RICYT) (<u>http://www.ricyt.org/en/</u>). Data years: 2012–2021.

2.3.2 Gross expenditure on R&D, % GDP

Gross expenditure on R&D (% of GDP) | 2020

Gross expenditure on R&D (GERD) is the total domestic intramural expenditure on R&D during a given period as a percentage of GDP. "Intramural R&D expenditure" is all expenditure for R&D performed within a statistical unit or sector of the economy during a specific period, regardless of the source of funding.

Source: UNESCO Institute for Statistics (UIS) online database (<u>http://data.uis.unesco.org</u>); Eurostat database (<u>https://ec.europa.eu/eurostat/data/database</u>); OECD, Main Science and Technology Indicators (MSTI) database (<u>https://stats.oecd.org/Index</u>. aspx? DataSetCode=MSTI_PUB); and Ibero-American and Inter-American Network of Science and Technology Indicators (RICYT) (<u>http://www.ricyt.org/en/</u>). Data years: 2013–2021.

2.3.4 **QS university ranking, top 3***

Average score of the top three universities according to the QS world university ranking* | 2021

Average score of the top three universities per country. If fewer than three universities are listed in the QS ranking of the global top 1,000 universities, the sum of the scores of the listed universities is divided by three, thus implying a score of zero for the non-listed universities. The 2022 ranking corresponds to data published in June 2021.

Source: QS Quacquarelli Symonds Ltd, QS World University Rankings, Top Universities (<u>https://www.topuniversities.com/university-rankings/world-university-rankings/2022</u>). Data year: 2021.

3 Infrastructure

3.1 Information and Communication Technologies (ICTs)

3.1.1 ICT access*

ICT access index* | 2020

The ICT access index is a composite index that assigns weights to four ICT indicators (25 percent each): (1) Percentage of the population covered by mobile networks (at least 3G, at least LTE/WiMax); (2) Mobile cellular telephone subscriptions per 100 inhabitants; (3) International internet bandwith (bit/s) per internet user; and (4) Percentage of households with internet access.

Source: World Intellectual Property Organization (https://www.wipo.int/); and World Telecommunication/ICT indicators Database (February 2022 edition) (https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx). Data year: 2020.

3.1.2 ICT use*

ICT use index*a | 2020

The ICT use index is a composite index that assigns weights to four ICT indicators (25 percent each): (1) Percentage of individuals using the internet; (2) Fixed (wired) broadband internet subscriptions per 100 inhabitants; (3) Active mobile broadband subscriptions per 100 inhabitants; and (4) Mobile broadband internet traffic (gigabytes/subscriptions).

Source: World Intellectual Property Organization (https://www.wipo.int/); and World Telecommunication/ICT indicators Database (February 2022 edition) (https://www.itu.int/ en/ITU-D/Statistics/Pages/publications/wtid.aspx). Data year: 2020.

4 Market Sophistication

4.1 Credit

4.1.1 Finance for startups and scaleups

Finance for startups and scaleups | 2021

Average perception scores (five-year average) of experts on finance for starting and growing firms (item A of the GEM National Expert Survey). Experts in different fields (purposive sampling, minimum 36 experts per year) assess conditions for entrepreneurship in their country via statements (1=completely false; 10 = completely true). Country participation in GEM varies and therefore the number of experts and years on which this item is based differs according to country.

Source: Global Entrepreneurship Monitor (GEM), National Expert Survey (NES) (https:// www.gemconsortium.org/wiki/1142). Data years: 2017–2021.

4.2 Investment

4.2.2 Venture capital investors, deals/bn PPP\$ GDP

Number of venture capital deals invested in (per billion PPP\$ GDP, three-year average) | 2021

Refinitiv data on private equity deals, per deal, with information on the location of the firm investing in a venture capital (VC) deal, among other details. The data extraction corresponds to a query on VC deals between January 1, 2019 and December 31, 2021, with the data aggregated by the location of the investing firm. The data represent the three-year average of 2019–21 deals invested in and are reported per billion PPP\$ GDP.

Source: Refinitiv (a London Stock Exchange Group (LSEG) business) Eikon (private equity screener) accessed March 21, 2022 (https://solutions.refinitiv.com/ eikon-trading-software); and International Monetary Fund, World Economic Outlook Database, October 2021 (https://www.imf.org/en/Publications/WEO/weo-database/2021/ October). Data years: 2019–2021.

5 Business Sophistication

5.1 Knowledge Workers

5.1.2 **Firms offering formal training,** %

Firms offering formal training (% of firms) | 2019

The percentage of firms offering formal training programs for their permanent, full-time employees in the sample of firms in the World Bank's Enterprise Survey in each country.

Source: World Bank Enterprise Surveys (https://www.enterprisesurveys.org). Data years: 2011–2021.

5.1 Knowledge Workers

5.1.2 Firms offering formal training, %

Firms offering formal training (% of firms) | 2019

The percentage of firms offering formal training programs for their permanent, full-time employees in the sample of firms in the World Bank's Enterprise Survey in each country.

Source: World Bank Enterprise Surveys (https://www.enterprisesurveys.org). Data years: 2011–2021.

5.2 Innovation Linkages

5.2.1 University-industry R&D collaboration⁺

The extent to which businesses and universities collaborate on R&D⁺ | 2021

Average answer to the survey question: In your country, to what extent do businesses and universities collaborate on research and development (R&D)? [1 = not at all; 7 = to a great extent].

Source: World Economic Forum, Executive Opinion Survey 2021 (https://www.weforum.org/). Data years: 2014–2021.

5.3 Knowledge Absorption

5.3.4 FDI net inflows, %

GDP Foreign direct investment (FDI) net inflows (% of GDP, three-year average) | 2020

FDI net inflow is the average of the most recent three years of net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital and short-term capital as shown in the balance of payments. This data series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP. Data extracted from the World Bank's World Development Indicators database.

Source: International Monetary Fund, International Financial Statistics and Balance of Payments databases (https://data.imf.org/; https://www.worldbank.org/en/programs/ debt-statistics); and World Bank, International Debt Statistics. Data years: 2018–2020

5.3.5 **Research talent, % in businesses**

Researchers in business enterprise (%) | 2020

Researchers in the business enterprise sector, measured in full-time equivalence (FTE), refers to researchers as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, as well as in the management of these projects, broken down by the sectors in which they are employed (business enterprise, government, higher education and private non-profit organizations). In the context of R&D statistics, the business enterprise sector includes all firms, organizations and institutions whose primary activity is the market production of goods or services (other than higher education) for sale to the general public at an economically significant price and the mainly private non-profit institutions serving them; the core of this sector is made up of private enterprises.

Source: UNESCO Institute for Statistics (UIS) online database (http://data.uis.unesco.org); Eurostat database (https://ec.europa.eu/eurostat/data/database); OECD, Main Science and Technology Indicators (MSTI) database (https://stats.oecd.org/Index. aspx? DataSetCode=MSTI_PUB); and Ibero-American and Inter-American Network of Science and Technology Indicators (RICYT) (http://www.ricyt.org/en/). Data years: 2013–2020.

6 Knowledge and technology outputs
6.1 Knowledge creation

6.1.1 Patents by origin/bn PPP\$ GDP

Number of resident patent applications filed at a given national or regional patent office (per billion PPP\$ GDP) | 2020

The definition of a patent can be found in the description of indicator 5.2.5. A resident patent application refers to an application filed with an IP office for or on behalf of the first-named applicant's country of residence. For example, an application filed with the Japan Patent Office by a resident of Japan is to be considered a resident application for Japan. Similarly, an application filed with the European Patent Office (EPO) by an applicant who resides in any of the EPO member states (for example, Germany) is considered to be a resident application for that member state (Germany). Data are scaled by PPP\$ GDP (billions).

Source: World Intellectual Property Organization, Intellectual Property Statistics (https:// www.wipo.int/ipstats); and International Monetary Fund, World Economic Outlook Database, October 2021 (https://www.imf.org/en/Publications/WEO/weo-database/2021/ October). Data years: 2014–2020.

6.1.3 Utility models by origin/bn PPP\$ GDP

Number of resident utility model applications filed at the national patent office (per billion PPP\$ GDP) | 2020

A utility model (UM) is a special form of patent right. The terms and conditions for granting a UM are slightly different from those for patents and include a shorter term of protection and less stringent patentability requirements. A resident UM application refers to an application filed with an IP office for or on behalf of the first-named applicant's country of residence. For example, an application filed with the IP office of Germany by a resident of Germany is considered a resident application for Germany. Data are scaled by PPP\$ GDP (billions).

Source: World Intellectual Property Organization, Intellectual Property Statistics (https:// www.wipo.int/ipstats); and International Monetary Fund, World Economic Outlook Database, October 2021 (<u>https://www.imf.org/en/Publications/WEO/weo-database/2021/</u> October). Data years: 2015–2020.

6.2 Knowledge Impact

6.2.2 New businesses/th pop. 15–64

New business density (new registrations per thousand population, 15–64 years old) | 2020 The number of newly registered firms with limited liability per 1,000 working-age people (aged 15–64 years old) per calendar year (new business density rate).

Source: World Bank, Entrepreneurship Database (<u>https://www.worldbank.org/en/</u>programs/entrepreneurship). Data years: 2012–2020.

6.2.5 High-tech manufacturing, %

High-tech and medium-high-tech manufacturing (% of total manufacturing output) | 2019

High-technology and medium-high-technology output as a percentage of total manufacturing output, on the basis of the OECD classification of Technology Intensity Definition (<u>https://www.oecd.org/sti/ind/48350231.pdf</u>), itself based on International Standard Industrial Classification (ISIC) Revision 4 and Revision 3, and using data from the INDSTAT 2 and INDSTAT 4 databases of the United Nations Industrial Development Organization (UNIDO).

Source: United Nations Industrial Development Organization (UNIDO), Industrial Statistics Database INDSTAT 2 2022 and INDSTAT 4 2022 (<u>https://stat.unido.org</u>). Data years: 2012–2020.

6.3 Knowledge Diffusion

6.3.3 High-tech exports, % total trade

High-tech exports (% of total trade) | 2020

High-technology exports as a percentage of total trade. See indicator 5.3.2 for details. Data for Hong Kong, China are corrected for re-exports using data from the Trade Data Monitor.

Source: United Nations Comtrade Database (<u>http://comtrade.un.org</u>); World Trade Organization and United Nations Conference on Trade and Development (<u>https://stats</u>. wto.org/); and Trade Data Monitor (<u>https://www.tradedatamonitor.com/</u>). Data years: 2015–2020.

7 Creative Outputs

7.1 Intangible Assets

7.1.2 Trademarks by origin/bn PPP\$ GDP

Number of classes in resident trademark applications issued at a given national or regional office (per billion PPP\$ GDP) | 2020

A trademark is a sign used by the owner of certain products or provider of certain services to distinguish them from the products or services of other companies. A trademark can consist of words or a combination of words and other elements, such as slogans, names, 252Global Innovation Index 2022 logos, figures and images, letters, numbers, sounds and moving images. The procedures for registering trademarks are governed by the legislation and procedures of national and regional IP offices. Trademark rights are limited to the jurisdiction of the IP office that registers the trademark. Trademarks can be registered by filing an application at the relevant national or regional office(s) or by filing an international application through the Madrid System. A resident trademark application refers to an application filed with an IP office for or on behalf of the first-named applicant's country of residence. For example, an application filed with the Japan Patent Office by a resident of Japan is considered to be a resident application for Japan. Similarly, an application filed with the Office for Harmonization in the Internal Market (OHIM) by an applicant who resides in any of the EU member states, such as France, is considered to be a resident application for that member state (France). This indicator is based on class count - the total number of goods and services classes specified in resident trademark applications. Data are scaled by PPP\$ GDP (billions).

Source: World Intellectual Property Organization, Intellectual Property Statistics (www. wipo.int/ipstats); and International Monetary Fund, World Economic Outlook Database, October 2021 (<u>https://www.imf.org/en/Publications/WEO/weo-database/2021/October</u>). Data years: 2012–2020.

7.1.3 Global brand value, top 5,000, % GDP

Global brand value of the top 5,000 brands (% of GDP) | 2021

Sum of global brand values, top 5,000 as a percentage of GDP. Brand Finance calculates brand value using the royalty relief methodology, which determines the value that a company would be willing to pay to license its brand if it did not own it. The methodology is compliant with industry standards set in ISO 10668. This approach involves estimating the future revenue attributable to a brand and calculating a royalty rate that would be charged for the use of the brand. Brand Finance's study is based on publicly available information on the largest brands in the world. This indicator assesses the economy's brands in the top 5,000 global brand database and produces the sum of the brand values corresponding to that economy. This sum is then scaled by GDP. A score of 0 is assigned where there are no brands in the country that make the top 5,000 ranking. A score of "n/a" is assigned where Brand Finance has been unable to determine if there are brands from the country that would rank within the top 5,000 due to data availability limitations.

Source: Brand Finance database (https://brandirectory.com/); and International Monetary Fund, World Economic Outlook Database, October 2021 (https://www.imf.org/en/ Publications/WEO/weo-database/2021/October). Data year: 2021.

7.2 Creative Goods and Sevices

7.2.1 Cultural and creative services exports, % total trade

Cultural and creative services exports (% of total trade) | 2020

Creative services exports as a percentage of total exports according to the Extended Balance of Payments Services Classification EBOPS 2010 – that is, EBOPS code SI3: Information services; code SJ22: Advertising, market research, and public opinion polling services; code SK1: Audio-visual and related services; and code SK23: Heritage and recreational services as a percentage of total trade. Values are based on the classification of the sixth (2009) edition of the International Monetary Fund's Balance of Payments and International Investment Position Manual and Balance of Payments database. See indicator 5.3.1 for the full definition of total trade.

Source: World Trade Organization and United Nations Conference on Trade and Development, Trade in Commercial Services database (https://stats.wto.org/). Data years: 2012–2020.

7.2.5 Creative goods exports, % total trade

Creative goods exports (% of total trade) | 2020

Total value of creative goods exports (current USD) over total trade. Creative goods exports based on the 2009 UNESCO Framework for Cultural Statistics, Table 3, International trade of cultural goods and services defined with the Harmonized System (HS) 2007 codes; World Trade Organization and United Nations Conference on Trade and Development, Trade in Commercial Services database, itself based on the sixth (2009)

edition of the International Monetary Fund's Balance of Payments and International Investment Position Manual and Balance of Payments database.For the definition of total trade, see indicator 5.3.1.

Source: United Nations Comtrade Database (http://comtrade.un.org); and World Trade Organization and United Nations Conference on Trade and Development (https://stats. wto.org/). Data years: 2015–2020.

7.3 Online Creativity

7.3.4 Mobile app creation/bn PPP\$ GDP

Global downloads of mobile apps (per billion PPP\$ GDP, two-year average) | 2021

Global downloads of mobile apps, by origin of the headquarters of the developer/firm, scaled by PPP\$ GDP (billions). Global downloads are compiled by data.ia, public data sources and the company's proprietary forecast model based on data from Google Play Store and iOS App Store in each country. Since data for China are not available for Google Play Store and only for iOS App Store, data from China are treated as missing and classified as "n/a."

Source: data.ia (formerly App Annie) (https://www.data.ai/en/); and International Monetary Fund, World Economic Outlook Database, October 2021 (https://www.imf.org/ en/Publications/WEO/weo-database/2021/October). Data years: 2019–2021.

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GLOSSARY

Accelerators	Organizations which aim to accelerate new venture creation by providing education and mentoring to cohorts of ventures during a limited time (Cohen and Hochberg, 2014).
Artificial Intelligence	Refers to the use of algorithms with the imitation of all human intellectual abilities by computers (Sheikh et.al, 2023).
Additive Manufacturing	A technology rapidly expanding in a number of industrial sectors. It provides design freedom and environmental/ecological advantages. It transforms essentially design files to fully functional products (Bikas et.al, 2016).
Big Data	Big data is larger, more complex data sets, especially from new data sources. These data sets are voluminous such that traditional data processing software cannot manage them. These massive volumes of data can be used to address business problems never been tackled before (Oracle, n.d.).
Blue Economy	Sustainable use of ocean resources for economic growth, improved livelihoods and jobs, while preserving the ocean ecosystem. (RA No. 11293, 2019)
Business Incubators	Facilities where startups are hosted, and business development services are provided. (RA No. 11293, 2019)
Climate Change	A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer, whether due to natural variability or as a result of human activity. (RA No. 9729, 2009)
Cloud Computing	A technology that provided faster innovative, flexible resources and economic scaling by providing computing services (including server, storage, database, network, software, analysis, and machine intelligence) over the cloud (Seyrek, 2011).
Cluster Policies	Policies which aim to support geographic concentrations of interconnected firms and related actors, such as specialized service providers, academic or educational institutions, MSMEs, businesses, among others. (RA No. 11293, 2018)
Cryptocurrency	Digital financial assets, for which ownership and transfers of ownership are guaranteed by a cryptographic decentralized technology (Giudici, et. al, 2020).
Cybersecurity	Collection of tools, policies, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organization and user's assets. (RA No. 10175, 2012)
Data Analytics	The science of integrating heterogeneous data from diverse sources, drawing inferences, and making predictions to enable innovation, gain competitive business advantage, and help strategic decision-making (Gudivada, 2017).
Design Thinking	A systemic, intuitive, customer-focused problem-solving approach that organizations can use to respond to rapidly changing environments and to create maximum impact (McKinsey, 2023).

Digital Transformation	The integration of digital technology into all areas of a business, fundamentally changing the operations and value delivery to customers. It is a cultural change that requires organizations to continually challenge the status quo, experiment, and get comfortable with failure. Digital transformation is imperative for all businesses, from the small to the enterprise.
Digital Skills	A range of skills, encompassing a combination of behaviors, expertise, know-how, work habits, character traits, dispositions, and critical understanding on the use of digital devices, communication applications, and networks to access and manage information. (RA No. 11927, 2022)
Digital Twin	Virtual representations of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision making (IBM, 2022).
Disruptive Innovation/Disruptive Technologies	New technology that completely changes the way the industry or market functions, creating a new value proposition in an uncontested market space.
Dynamic Innovation Ecosystem	State of an ecosystem formed by a dynamic and complex relationship among innovation actors. They work together in performing innovation activities that transform ideas into new or improved products and services that are market-valued, market-driven, and market-oriented.
e-Commerce	The sale of purchase of goods and services, whether between businesses, households, individuals, governments, and other public or private organizations, conducted over computer-mediated networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or offline (OECD).
e-Governance	Use of information and communications technology by the government and the public to enhance the access to and delivery of government services to bring about efficient, responsive, ethical, accountable and transparent government service. (Senate Bill No. 318)
Edutainment	The combination of education and entertainment, or improving learning by making it more engaging (Makarius, 2017)
Fifth Industrial Revolution (5IR)	Refers to people working with robots and smart machines (Adel, 2022).
Fintech	A catch-all term for technology used to augment, streamline, digitize or disrupt traditional financial services.
Fourth Industrial Revolution (FIRe)	A union among the physical assets and advanced technologies such as artificial intelligence, IoT, robots, 3D printing, cloud computing, etc (Adel, 2022).
Futures Thinking	A strategic approach to explore and critically consider future scenarios in order to define the most preferable ones for people and society. The aim of Futures Thinking is to provide policy-makers, and more broadly decision-makers in any field, with the capacity to proactively anticipate changes, recognize opportunities, and ease the transition toward desirable futures (Canina et.al, 2022).

Genetic Resources	Genetic material, which are any material of plant, animal, microbial or other origin containing functional units of heredity, of actual or potential value. (RA No. 11293, 2018)
Global Innovation Index	The annual ranking of countries by their capacity for, and success in, innovation, published by the World Intellectual Property Organization. It was started in 2007 by INSEAD and World Business. serves as the global benchmark that measures innovation along key seven pillars namely, a) Institutions, b) Human Capital and Research, c) Infrastructure, d) Market Sophistication, e) Business Sophistication, f) Knowledge and Technology Outputs, and g) Creative Outputs. It ranks the innovation performance of around 132 economies in the world by highlighting innovation strengths and weaknesses.
Hackathon	A highly engaging, continuous event in which people in small groups produce working software prototypes in a limited amount of time (Komssi et.al, 2015).
Inclusive Innovation	The creation of new ideas that results in the development of new products, processes and services, that help improve the welfare of lower-income and marginalized groups. (RA No. 11293, 2018)
Incubators	Specialized corporate units that hatch new businesses by providing physical resources and support.
Innovation	The creation of new ideas that results in the development of new or improved policies, products, processes, or services which are then spread or transferred across the market. (RA No. 11293, 2018)
Innovation Alliance	A coalition of research and development-based technology companies, academic or educational institutions, and/or research institutions, MSMEs and other relevant organizations, that have come together to support innovative efforts and enterprises.
Innovation Centers	Centers of competence and innovation activities, either housed in academic, educational, or non-academic facility that supports collaborative research, development and extension (RD&E) initiatives and innovation-related activities between and among academic or educational institutions, RD&E centers, and business. (RA No. 11293, 2018)
Innovation Governance	The institutional setup of the various elements of the national innovation ecosystem, including the institutional structures and the processes governing policymaking and implementation, such as program delivery and monitoring, as well as the process of coordination and collaboration across public institutions and with relevant stakeholders. (RA No. 11293, 2018)
Innovation Networks	The interconnected system of companies and organizations in the knowledge infrastructure that is mainly focused on innovation. (RA No. 11293, 2018)
Innovative Goods and Services	New or significantly improved products, services, processes, technical specifications or components, methods, and tools that enhance the government's ability to deliver services. (RA No. 11293, 2018)
Intellectual Property (IP)	Creations of the mind, such as scientific and technological inventions (patent/utility model); literary and artistic works (copyright); designs (industrial design); and symbols, names and images used in commerce (trademark).

Interoperability	The ability of two or more systems to exchange information and understand that exchanged information (Hodap et.al, 2022).
Internet-of-Things (IoT)	Describes physical objects embedded with sensors and actuators that communicate with computing systems via wired or wireless networks—allowing the physical world to be digitally monitored or even controlled (McKinsey, 2022).
Knowledge Products	Documents and publications derived from expertise, research, and lessons learned that respond to different demands of users and may cover a wide range of purposes. (DSWD, 2011)
Machine Learning	A branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy (IBM, 2023).
Micro-, Small, and Medium Enterprise (MSMEs)	This refers to any business activity or enterprise engaged in industry, agribusiness and/or services that has: (a) an asset size (less land) of up to PHP100 million; and (b) an employment size with less than 200 employees. Based on these categories, it is classified as micro, small, or medium regardless of the type of business ownership (i.e., single proprietorship, cooperative, partnership, or corporation).
Mixed Reality	An emerging technology that deals with maximum user interaction in the real world compared to other similar technologies. (Rokhsaritalemi,et. al,2020)
Multi-stage Process	The various stages of product or solution development, from feasibility study, designing, prototyping, testing, and commercialization of products or services. (RA No. 11293, 2018)
National Innovation Agenda and Strategy Document	The country's vision and long-term goals for innovation. It also provides a roadmap and strategies for improving innovation governance; deepening and accelerating innovation efforts; and integrating and fostering public-private partnerships.
National Innovation Agenda Framework	Subscribes to the AmBisyon 2040: matatag, maginhawa, at panatag na buhay as the preferred future. Amid various challengespresent and future, both anticipated and unanticipatedthe key to achieving the AmBisyon 2040 is to transform the country into a Smart and Innovative Philippines. This involves having: (a) a proactive, smart, and innovative people; (b) a competitive and resilient economy; (c) a collaborative and reliable institutions; and (d) an efficient, clean, and sustainable environment.
National Innovation Day	A celebration that seeks to promote public awareness and national support for innovation and highlight milestones of government and private sector initiatives. The 21st of April is hereby declared as a special working public holiday throughout the country. (RA No. 11293, 2018)
(The) Philippine Innovation Act	Republic Act (RA) No. 11293 otherwise known as the "Philippine Innovation Act" was signed by President Rodrigo R. Duterte on April 17, 2019. The law mandates the creation of the National Innovation Council (NIC) that will steer the whole-of-government coordination and collaboration and to remove the fragmentation in the country's innovation governance.
	The NIC is also tasked to set the direction of the country's innovation goals, priorities, and long-term national strategies through the formulation of the National Innovation Agenda and Strategy Document (NIASD).

Policy Innovation	The introduction of new or significantly different solutions to policy problems. (RA No. 11293, 2018)
Pre-commercial Procurement	The procurement of RD&E services for services, solutions, or products that do not yet exist, which may involve contracting by development phase from the conduct of feasibility study, designing, prototyping, testing, and commercialization of products or services. (RA No. 11293, 2018)
Regulatory Sandboxes	A regulatory sandbox is a regulatory approach, typically summarized in writing and published, that allows live, time-bound testing of innovations under a regulator's oversight. Novel financial products, technologies, and business models can be tested under a set of rules, supervision requirements, and appropriate safeguards.(UNSGSA, n.d.)
Science, Technology, and Innovation (STI)	A broad term that is used to describe impacts on social and economic fields by scientific and technological breakthroughs.
Startups	Any person or registered entity in the Philippines which aims to develop an innovative product, process, or business model. (RA 11337 of 2019)
Strategic Foresight	A structured and systematic way of using ideas about the future to anticipate and better prepare for change. It is about exploring different plausible futures that could arise, and the opportunities and challenges they could present. (OECD, n.d.)
Technology Diffusion Procurement	Public procurement that is undertaken on behalf of end-users with the view to accelerating the diffusion of innovative solutions or technologies that offer the greatest advantage to users. (RA No. 11293, 2018)
Technology Platforms	Self-organized programs or arrangements that allow a wide range of stakeholders to collaborate in identifying common needs and to assemble a portfolio of funding sourced from government or industrial sources or a mix thereof to address those needs. (RA No. 11293, 2018)
Technology Programs	Programs that link industrial, academic or educational RD&E efforts towards building national capacities in developing industrially important technologies. (RA No. 11293, 2018)
Traditional Cultural Expressions	Forms in which traditional culture is expressed and passed from generation to generation, which then become part of the identity and heritage of a traditional or indigenous community. (RA No. 11293, 2018)
Traditional Knowledge	Body of knowledge, innovations, systems, and practices of indigenous peoples and local communities developed, sustained and passed from generation to generation within a community, and often forming part of the community's cultural heritage or spiritual identity. (RA No. 11293, 2018)

ACRONYMS

4IR	Fourth Industrial Revolution
ABM	Accountancy, Business, and Management
AI	Artificial Intelligence
ARTA	Anti-Red Tape Authority
ASEAN	Association of Southeast Asian Nations
BFAR	Bureau of Fisheries and Aquatic Resources
BSP	Bangko Sentral ng Pilipinas
CHED	Commission on Higher Education
COA	Commission on Audit
CRADLE	Collaborative Research and Development to Leverage Philippine Economy
csc	Civil Service Commission
DA	Department of Agriculture
DAP	Development Academy of the Philippines
DBM	Department of Budget and Management
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DFA	Department of Foreign Affairs
DICT	Department of Information and Communications Technology
DILG	Department of the Interior and Local Government
DND	Department of National Defense
DOE	Department of Energy
DOF	Department of Finance
DOH	Department of Health
DOJ	Department of Justice
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DOT	Department of Tourism
DOTr	Department of Transportation
DRRM	Disaster Risk Reduction and Management
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
ESG	Environmental, Social and Governance
FDA	Food and Drug Administration
FDI	Foreign Direct Investment
FIRe	Fourth Industrial Revolution

GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
GII	Global Innovation Index
GNI	Gross National Income
GPPB	Government Procurement Policy Board
HEI	Higher Education Institutions
HUMMS	Humanities and Social Sciences
ІСТ	Information and Communications Technology
ΙοΤ	Internet of Things
IP	Indigenous People
ID	Industrial Design
IP	Intellectual Property
IPOPHL	Intellectual Property Office of the Philippines
IRR	Implementing Rules and Regulations
ITSO	Innovation and Technology Support Offices
LGU	Local Government Unit
моос	Massive Open Online Courses
MSME	Micro, Small, and Medium Enterprise
NAST	National Academy of Science and Technology
NCR	National Capital Region
NDRRMC	National Disaster Risk Reduction and Management Council
NEDA	National Economic and Development Authority
NFA	National Food Authority
NGA	National Government Agency
NGO	Non-government Organization
NIASD	National Innovation Agenda and Strategy Document
NIC	National Innovation Council
NICER	Niche Centers in the Regions for Research and Development
NICP	National Innovation Communication Plan
NIMEX	National Innovation Monitoring and Evaluation Matrix
NNC	National Nutrition Council
ΡΑΡ	Programs, Activities, and Projects
PCC	Philippine Competition Commission
PDP	Philippine Development Plan
PEZA	Philippine Economic Zone Authority
PhilGEPS	Philippine Government Electronic Procurement System
PhilRice	Philippine Rice Research Institute
PhilSA	Philippine Space Agency

PhilSys	Philippine Identification System
PIDS	Philippine Institute for Development Studies
PPP	Public-Private Partnerships
PQF	Philippine Qualifications Framework
PSAC	Private Sector Advisory Council
PSF	Philippine Skills Framework
PSTO	Provincial Science and Technology Office
PUV	Public Utility Vehicle
R&D	Research and Development
RA	Republic Act
RCEP	Regional Comprehensive Economic Partnership
RDE	Research, Development, and Extension
RDI	Research and Development Institutions
RDLead	R&D Leadership
RE	Renewable Energy
RIIC	Regional Inclusive Innovation Center
S&T	Science and technology
S4CP	Science for Change Program
SGLG	Seal of Good Local Governance
SIPP	Strategic Investment Priority Plan
SIRI	Smart Industry Readiness Index
SME	Small and Medium Enterprise
SRDP	Strengthening and Revitalizing of the Self-Reliant Defense Posture
STEM	Science, Technology, Engineering, and Mathematics
STI	Science, Technology, and Innovation
STPs	Science and Technology Parks
SUC	State Universities and Colleges
ТВІ	Technology Business Incubator
TESDA	Technical Education and Skills Development Authority
TTBDO	Technology Transfer and Business Development Offices
TVET	Technical-Vocational Education and Training
UM	Utility Model
UNESCO	United Nations Educational, Scientific and Cultural Organization
WIPO	World Intellectual Property Organization

NIASD organizational setup

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