Republic of the Philippines
Department of Environment and Natural Resources
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Website: http://www.denr.gov.ph / E-mail: web@denr.gov.ph

MEMORANDUM

FOR : All Bureau Directors
The Director, Climate Change Service

FROM : The OIC-Director, Policy and Planning Service

SUBJECT : **REQUEST FOR REVIEW AND COMMENTS ON THE DRAFT NATIONAL INNOVATION AGENDA 2032 WORKING DOCUMENT**

DATE : 27 MAY 2022

This refers to the email sent by the National Innovation Council Secretariat last 26 May 2022 requesting for comments for the finalization of the National Innovation Agenda 2032 working document that was the product of the National Innovation Agenda 2023 Writeshop held last 24 May 2022.

In view of the above, may we request for comments/positions of your respective office on or before 31 May 2022 via email at psddivision@gmail.com. Attached are the pertinent documents for your perusal.

For your preferential action, please.

GLENN MARCELO C. NOBLE

MEMO NO. 2022 - 349

Gmail **PSD Document <psddivision@gmail.com>**

Fwd: [FOR ACTION] Review and Approval of the Draft National Innovation Agenda 2032

1 message

OUEIEA Secretariat <oueiea.denr@gmail.com> Fri, May 27, 2022 at 9:16 AM
To: PSD Document <psddivision@gmail.com>, lsmojica@denr.gov.ph

Office of the Undersecretary
Policy, Planning and International Affairs
Department of Environment & Natural Resources
Visayas Ave., Diliman, Quezon City
Philippines 1100
Telephone No.: (+632) 928 1195
Telefax No.: (+632) 928 1186

---------- Forwarded message ---------
From: **NEDA National Innovation Council Secretariat** <nicsecretariat@neda.gov.ph>
Date: Thu, May 26, 2022 at 8:13 PM
Subject: [FOR ACTION] Review and Approval of the Draft National Innovation Agenda 2032
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Cc: &PPG-OASec - Innovation Staff - spid <&INNOS-spid@neda.gov.ph>, &PPG-OASec - Innovation Staff - od <&INNOS-od@neda.gov.ph>

Dear **NIC-ETB Principals,**

Thank you very much for your active participation and valuable inputs during the National Innovation Agenda 2032 Writeshop held on 24 May 2022 at Richmonde Hotel, Ortigas.

The National Innovation Council Secretariat has incorporated herewith your inputs in the document attached for your final vetting and approval. Please note that other specific inputs will be part of the Innovation Agenda Strategy to be crafted come the next administration.

As agreed during the event, we would appreciate your feedback on or before **1 June 2022 (Wednesday)**. We will deem that your office has no objections to the draft document if no comments were to be received by the NIC Secretariat.

Thank you very much.

Best regard,

National Innovation Council Secretariat
Innovation Staff
National Economic and Development Authority

NEDA Branding

National Economic and Development Authority

NEDA Branding

NEDA National Innovation Council Secretariat

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National Innovation Agenda 2032

Smart and Innovative Philippines towards AmBisyon 2040

As of **26 May 2022**

Table of Contents

The Philippine Innovation Act of 2019

Republic Act No. 11293

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 country's development policies to drive inclusive development.

National Innovation Council

The law mandates the creation of the National Innovation Council (NIC). The NIC is a 25-member policy advisory body in the formulation, development, implementation, and monitoring of the country's innovation goals, priorities, and long-term national strategy.
It is chaired by the President of the Philippines. The Secretary of the National Economic and Development Authority (NEDA) serves as Vice-Chairperson and is joined in the Council by 16 Department Secretaries, and seven Executive Members from the private sector, such as the business, micro-, small-, and medium enterprises (MSMEs), research, and scientific communities.

National Innovation Council Secretariat

Also known as the NEDA Innovation Staff, the NIC Secretariat provides technical, managerial, advisory, and secretariat services to the Council and other government agencies on matters related to strategic innovation policy direction and coordination.

National Innovation Agenda and Strategy Document (NIASD)

The NIASD is the country's 10-year vision, long-term goals, and strategies for improving innovation governance on innovation priority areas deemed important by the NIC.

Innovation Fund

The Act established an Innovation Fund which aims to strengthen entrepreneurship and enterprises engaged in developing innovative solutions benefiting the poorest of the poor directly or indirectly.

The NIC shall screen and approve qualified proposals which can be issued grants under the Innovation Fund.

Innovation Development Credit and Financing

The Act also provides an innovation development credit and financing program to generate and scale-up innovation in accordance with the NIASD. Innovation development credit consists of loans and other financing activities for purposes including the development of innovation.

National Innovation Day

To promote public awareness and national support for innovation and highlight milestones of government and private sector initiatives, April 21 of every year is declared as National Innovation Day. Programs and activities that will involve the participation of other national government agencies, local government units (LGUs), the private sector, and schools shall be planned, designed, and implemented in celebration of this day.

Regional Innovation and Cluster Policy

The Act mandates cluster policies or strategies as significant components of the country's innovation policy mix. In determining the feasibility and effectiveness of cluster policies in pursuit of innovation goals, other policy streams, such as regional economic development policy, industrial and enterprise policy, and higher education policy, among others, shall be considered.

Unlocking Filipinnovation

Why innovate?

Innovation is a vital component of national development and sustainable economic growth. Innovation is defined as the development of new or improved products, processes, or services which are then transferred across markets.

Science and technology (S&T) institutions have a long history in the Philippines. In 1905, the Bureau of Government Laboratories was created, which facilitated the control of disease transmission. In 1987, the National Science and Technology Authority was renamed as Department of Science and Technology, revising the agency's mandate. The national development of S&T, encompassing industry innovation, is further strengthened by the development of the Science and Technology Master Plan.

In 2015, NEDA spearheaded the AmBisyon 2040 survey where Filipinos articulated their aspiration to enjoy a "matatag, maginhawa at panatag na buhay." Given current and expected challenges, we need to promote a smart and innovative society that is inclusive, resilient, and sustainable.

The 2017-2022 Updated Philippine Development Plan (PDP) identified issues on science, technology, and innovation as follows: (i) fragmented and limited linkages among the government, business, academe, and the research and development (R&D) community; (ii) absence of a robust and adaptive intellectual property (IP) culture; (iii) inadequate R&D support and infrastructure, and (iv) underutilized S&T innovations.

Moving forward from 2019, the Philippine Innovation Act mandated the creation of the National Innovation Council (NIC); a recognition that innovation requires collaboration and multistakeholder support. The NIC sets the strategic innovation direction and harnesses the innovativeness of the Filipinos towards nation-building. It also appropriates funds to prioritize innovation priority areas towards national development.

Currently, the Philippines' Global Innovation Index (GII) ranks 11th out of 17 economies in Southeast Asia, East Asia, and Oceania in 2021. Across the world, the country ranks 51st out of 132 economies. The National Innovation Agenda aims to improve this by driving the key actors to formulate solutions and solve gaps in our Science, Technology, and Innovation (STI) systems.

With these, an enhanced national innovation system will further boost economic growth. The government as the ecosystem enabler will drive more innovation outputs by providing more innovation inputs through policy, financing, infrastructure, and encouraging innovation culture. From fragmented and disharmonized initiatives, the Filipinnovation movement strives to enable

a thriving and collaborative innovation ecosystem. It provides a strong foundation for our goals of a competitive economy, efficient governance system, and flexible industry positioning of micro, small, and medium enterprises (MSMEs) unbounded by geographic borders.

Through this harmonized innovation ecosystem, aspiring and established Filipino scientists, entrepreneurs, farmers, fisherfolk, and other stakeholders will be provided access to enabling mechanisms such as Negosyo Centers, innovation hubs, mentorship, capital, shared facilities, training, scholarships, and opportunities towards improved livelihoods.

Our desire is to go beyond the hype of innovation and digitalization while creating a real and lasting impact on our stakeholders.

This revitalized ecosystem is the key to achieving a smart and innovative Philippines – a productive, resilient, sustainable, and inclusive nation by 2032.

It is now time we unlock Filipinnovation.

Horizon Scanning

Technological Trends

Automation and Artificial Intelligence (AI)

Automated systems and artificial intelligence algorithms will be more accessible by the year 2032. From the USD 191.89 billion valuation of the automation market in 2021, it is projected to grow to USD 395.09 billion by 2029, exhibiting a compound annual growth rate of 9.8. These computing systems will make way for faster and more customized services, which can impact job security in the future as machines will have more efficiency and reliability than humans. Additionally, this trend has the power to increase revenues, boost resource efficiencies, and improve sustainability.

Moreover, the use of internet has tremendously increased in the Philippines, from 23 million in 2010, it has tripled to 73 million in 2020. On average, every Filipino spends nearly 10 hours a day on the internet (World Bank, 2020). This trend will move both government and businesses to further maximize the benefits of technology and digitalization in delivering their services to the people.

Conversely, the rise of AI and automation may erode the Philippines' traditional strengths or competitive advantage in the availability of skilled manpower, low wages, and availability of large manufacturing facilities, among others. An innovation-driven economy is necessary to shift, re-orient, and diversify strengths and advantages.

Space Technology

Space applications such as the use of geospatial technologies will have increased adoption relevant in disaster mitigation, natural resources management, food production, human protection, ship and aircraft navigation, and enhancement of communication.

The Philippines' entry point in the space industry is in space asset maintenance, repair, and overhaul (MRO), assembly integration, and testing (AIT), and satellite servicing. In the Philippines, space technology will be used for earth observation and analytics necessary for disaster risk management and environmental management, and satellite communication and ground services to expand broadband access.

Space exploration will also become a trend for wealthy countries, building extraterrestrial infrastructure–which will ultimately provide a wider understanding of the universe.

Decentralization

Decentralized architecture and systems are expected to grow in the next ten years. Mostly in the form of distributed ledgers or blockchain, from centralized databases, servers are hosted by each member of the network–increasing data and information availability, as well as transparency as transactions using these, are available publicly.

The trend of cryptocurrency is also entering traditional money markets such as the stock exchange. These also follow the rising adoption of government-issued cryptocurrencies such as the digital Yuan. The emergence and evolution of the blockchain and cryptocurrency technology into other forms such as non-fungible tokens (NFTs) should also be further studied and scrutinized so as to update and future-proof our existing monetary rules and regulations.

Political Trends

Devolution and powerful cities

The urbanization and growth in cities, coupled with the implementation of the Mandanas ruling are seen to shift political power and resources from the national government to local governments. The increase in the Internal Revenue Allotment (IRA) of Local Government Units (LGUs), to be known moving forward as the National Tax Allotment (NTA), places responsibility on the LGUs to provide better and more comprehensive services for their constituents.

While metropolitan centers are expected to provide higher forms of economic services and facilities, including innovation and advanced services, culture and tourism, education and research, transportation and trade, manufacturing, and technology development. In turn, LGUs are expected be more responsive in the long-run.

Political actors will encourage more innovation and intellectual property rights in the government agencies' products, processes, and services. Social media and citizen engagement channels will continue to play a part in promoting e-democracy through various communication platforms.

Geopolitical tensions

Geopolitical tensions are on the rise with the eruption of conflict between Ukraine and Russia in Europe. This conflict may potentially trigger conflict in other parts of the world. Conflicts will increase global uncertainty, dampen investor and business sentiment, and cloud the outlook for global growth moving forward. Territorial disputes on energy exploration will be a central topic for strategic negotiations and global tension.

Youth participation

The Philippines today has a young population with 40% that is 20 years old and below. With digitalization, young Filipinos have found ways to be more engaged with society. To increase the potential of young people as drivers of the knowledge economy, there is a need to provide

quality and accessible education so they will be equipped with literacy and critical thinking skills to counter the disinformation in the digital age and participate in the decision making process at the local level and in strengthening check and balance at the national level.

However, there is still difficulty on how they can have a voice or role in the development of policies - the pipeline process on how to translate their inputs to outputs and long-term outcomes must be studied.

Economic Trends

Growing middle-class

According to the European Commission, the global middle class is projected to expand and reach 5.5 billion by 2030. Asians will comprise about 87% of the additional middle-class population, and Asia will command more than 50% of global middle-class consumption by 2030.

As of 2019, the Philippines was categorized as a lower-middle-income country due to the Covid-19 pandemic and community quarantine measures imposed in the country. However, with continued recovery and reform efforts from the impact, the country is expected to transition from a lower middle-income country to an upper-middle-income country.

Urbanization

People in search of better opportunities such as jobs, services, and education, have been moving from rural to urban areas across the world. According to the European Commission, this accelerating trend is likely to continue in the future. The number of people living in cities has more than doubled over the last 40 years and is projected to reach 5 billion by 2050. This urbanization can contribute to sustainable growth if managed well by increasing productivity, allowing innovation and new ideas to emerge.

In the East Asia and Pacific region, the Philippines is one of the fastest urbanizing countries (World Bank Group, 2017). In the past five decades, the urban population grew by over 50 million people, and by 2050, approximately 102 million people (more than 65 percent of the country's total population) will reside in cities. However, if not carefully managed and planned for, the benefits of urbanization will not be realized and can result in congestion, slums, pollution, inequality, and crime.

Digital Economy

If leveraged fully, digital transformation can unlock PHP5 trillion worth of economic value in the Philippines by 2030 (AlphaBeta, 2021). The consumer, retail, and hospitality; education and training; and agriculture and food sectors are projected to be the largest beneficiaries.

Digital transformation will be important to boost the country's economic recovery efforts and enhance the long-term resilience of its economy in the post-pandemic future. Digital transformation will be crucial in addressing the three potentially long-term implications of the pandemic for the Philippine economy: 1) the emergence of a hybrid workplace; 2) accelerating the shift towards digital payments, and 3) severe disruptions to the business operations of MSMEs.

Social Trends

Population Growth

It is projected that the Philippine population will balloon to 124 million by 2030 as reported by the United Nations (UN) in 2019. An estimate of 84 million between the ages of 15 to 64 will comprise the working class. The aging population and lifestyle preferences will drastically affect area demographics. Meanwhile, the Philippine population is expected to increase by 142 million by 2045 with a corresponding peak by 2050 (Philippine Statistics Authority, 2010). The country is expected to harness a demographic dividend of a continuously growing workforce for a long period of time.

Migration and Diaspora

Brain drain and emigration will continuously be experienced by the Philippines, both physically and virtually. According to the UN (2019), it is projected that an estimated 350,000 Filipinos of various economic classes will be annual migrants. the Commission on Filipinos Overseas reported in 2019 that about 1,300 Filipinos with postgraduate degrees emigrate yearly. Piracy of local experts is expected without proper regulation and engagement of Filipinos worldwide. In the overseas Filipino workers (OFWs) diaspora, the Philippines employs 1.7 million annually consisting of individuals between 20 and 39 years old. This includes experts and professionals in the field (Tabuga, et al., 2021). Although growing in intellectual migration, the diaspora can also greatly contribute to strengthening the innovation culture of the Philippines should policies and reforms be promoted such as making the Balik Scientist Program more attractive to the diaspora and overseas Filipinos.

Learning Loss

Prior to the pandemic, the country's learning poverty, which is the percentage of 10-year-old children who cannot read and understand a simple story was already estimated at 69.5% based on TIMSS 2003 data (Cho et al., 2021). This rate, based on World Bank calculations, has risen to as much as 90% of learners struggling to learn effectively at home as of August 2021 (Muñoz-Najar et al., 2021). The Philippines will continue to bear the effects of the pandemic, adversely impacting human capital development.

Blended learning is expected to continue and be the default mode of education service delivery. Teachers and school leaders are expected to adapt to distance learning modalities which may or may not be limited through resource or personal capabilities. Following these, technologies

such as augmented realities and virtual realities are expected to enhance learning across all levels – but access to these technologies may continue to worsen learning loss incidences.

Widening Inequalities

An uneven wealth distribution all over the Philippines is critically observed, which dramatically increase inequality in society (e.g., education, labor, health, gender, territory). There is a growing consensus that inequality is an urgent issue that should be at the top of policymakers' agenda. Sadly, the COVID-19 pandemic has exposed and exacerbated many of the existing inequalities.

Trust and Ethical Trends

Misinformation and Disinformation

Increased digital dependency may lead to more cases of disinformation and misinformation. Algorithms that control the flow of distribution of information may still continue to go unregulated hence worsening the case of blatant, coordinated architectures of disinformation. With these still prevalent, erosion of trust among key institutions becomes easy to target. There is increasing use of propaganda, whether positive or negative, which leads to a deceived population.

Security, Threats, and Digital Surveillance

Artificial intelligence will be democratized and cause chaos at many levels of national security: food, supply chains, water, politics, environment, infrastructure, and transportation, among others.

Massive adoption of Internet-of-Things (IoT) in many industries becomes attractive for attacks by criminals resulting in digitally-powered and intensified levels of extortion and sabotage. Social engineering and blatant disinformation become harder to combat due to their massive scale. Now in the form of metaverse technologies such as virtual and augmented realities, forces begin to sabotage not just information but also the senses of human beings.

With the implementation of electronic medical records and digitization of health, the personal information of patients may be used both for the benefit of patients but may also be used to the advantage of businesses. The available information can improve the delivery of services, even for personalized healthcare, but if there are lapses in the protocols to maintain this data securely, it may be exploited for illegal use, data-for-sale business models, and weaponization.

The threats will come from criminals operating independently and from State actors who will continue to treat cyber as an integral military capability, especially for offensive operations. The country needs to develop the ability to collect, analyze, assess, and interpret various information to ensure security and safety. Artificial intelligence and new analytical tools, both software and hardware, are required to guide current and future decisions.

Ethical Veganism and Meat Alternate

People may see a more significant transition to ethical veganism and meat alternatives, which will negatively affect the agricultural sector, especially the livestock and poultry industries. Plant-based products also require complex processing, which may not meet consumer satisfaction and nutrients due to intensive production processes and the use of genetically modified organisms (GMO) technology. Genetic engineering and biotechnology also entail ethical considerations such as seeking consent from producers and consumers.

Regulatory Trends

Deregulation

Deregulation will be a continuing trend while being applied differently across industries and sectors. Foreign economic restrictions will continue to be eased or lifted (e.g., Public Service Act, Foreign Investment Act, Retail Trade Liberalization Act). The government began to adopt a regulatory sandbox framework in specific industries and sectors to ensure consumer protection and enable innovators from the MSME sector. For example, the Bangko Sentral will use this approach in regulating financial services. However, regulation also prohibits reforms.

Weak Institutions

Government institutions and policies are reactive and unable to keep up with the pace of technological advancements. This lag opens additional risks and makes society more susceptible to harmful impacts or unintended consequences of technological use. The government is slow to fully mainstream the use of foresight and anticipatory tools and methods.

Meanwhile, weak regulations of products in the virtual market, where the government minimally regulates the quality of products sold in venues such as Lazada and Shopee, put consumers at risk of counterfeit products or, worse, products detrimental to health.

Green Regulations

The need to adopt green regulations becomes more imperative due to climate change and worsening environmental quality. Enforcement of environmental laws and green regulations, including international commitments, have become stricter. Compliance with green regulations will differ across industries and sectors. Large enterprises are more likely to adopt environmental standards than MSMEs given needed resources to comply.

Increasing demand for accountability on agencies and companies for sustainability, both for practices and products, is expected to be observed. Encouraging green public procurement adoption in all government agencies and making it a basis for incentives and awards will be pursued.

Environmental Trends

Air Pollution

Air pollution will continue to be a problem in the Philippines. Due to industrial and vehicle emissions, the air quality will decrease, exacerbated by poor enforcement of relevant laws and regulations. The continued need for social distancing will cause air quality to further deteriorate as people will opt to use their own vehicles over commuting or taking mass transporttion, and more public utility vehicles may need to be deployed to ferry passengers at reduced factor loading.

However, with the development of measures to mitigate common air pollutants (e.g., particulate matter, NOx, SOx), air pollution abatement measures will shift towards currently emerging air pollutants, including microplastics, ultrafine particles, and black carbon. In 2019, the Philippines ranked the 57th out of 98 countries with an average US Air Quality Index reading of 63 and an average PM 2.5 reading of 17.6µg/m3.

Widespread use of vehicles that utilize alternative sources of power and more stations to charge or refill those vehicles will be necessary. Based on the 2016 GHG Emissions Inventory, transportation ranked third-largest emitter. Hence, the importance of the development of low carbon urban transportation systems.

Water Pollution

Due to rapid urbanization/industrialization, water quality will decrease, exacerbated by a lack of proper wastewater management facilities and poor enforcement of relevant laws and regulations. Microplastics and marine litter will also increase due to improper solid waste management, including plastics.

There is an increasing deterioration of our marine and aquatic resources due to pollution and degradation of ecosystems, especially by illegal fishing, mineral extraction, and endangered species collection. These activities further contribute to the inability of the natural ecosystem to mitigate pollution.

Solid, Hazardous, and Electronic Wastes

The volume of solid, hazardous (especially infectious healthcare) and electronic waste will continue to increase due to rapid urbanization and the continuous imposition of health protocols due to COVID-19 pandemic. Notwithstanding, innovative waste management systems (e.g. waste-to-energy, composting, urban mining) will be patronized or mainstreamed. Advocates will also promote circular economy models by utilizing what is usually considered waste as a new resource.

Natural Resources

Due to climate change, philippine crop yields will generally fall by 2.9 percent (National Academy of Science and Technology [NAST], 2021). Climate change negatively impacts the coastal and marine and terrestrial ecosystems and biodiversity (coral bleaching, changes in species movement and behavior, soil fertility). In addition, depletion of natural resources and biodiversity/scarce resources, and the occurrence of pests and diseases also affects productivity and resource use efficiency. By 2032, soil loss due to intensive cultivation is expected in lowlands and upland areas' heightened erosion rates will be prevalent (Briones, 2010).

In an effort to maximize the use of natural resources, it is expected that sustainable consumption and production (SCP) practices and green and climate-resilient technologies will be promoted across sectors. This includes the promotion of smart agriculture, retrofitting buildings to become more resource-efficient and climate-resilient, and increasing the quality of products while optimizing the human labor used. The conduct of urban carrying capacity assessments ensures that population growth/manmade development in a certain urban area can be sustained by its environment and does not cause degradation.

The country's total final energy consumption (TFEC), is expected to increase at an average rate of 4.3 percent annually, from 33.1 metric tons of oil equivalent (MTOE) in 2016 to 70.0 MTOE by 2032.

Climate Crisis

The Philippines is highly vulnerable to the impacts of climate change. The report published by GermanWatch in 2021 ranks the Philippines as the fourth country severely affected by weather-related loss events (e.g., storms, floods, droughts) from 2000 to 2019. Air temperature in the Philippines will increase as much as 2°C by 2050 and 1.5°C as early as 2032. While these may seem like slight changes, these are disastrous and will severely affect local ecologies.

According to the latest Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) climate change projections, we can expect (a) continuous warming at a rate of 0.1°C per decade; (b) increasing trends in annual rainfall and seasonal rainfall in many parts of the country associated with extreme rainfall events; (c) increase in the frequency of extreme tropical cyclones exceeding 170 kilometers per hour; and (d) a 20-centimeter increase in sea level rise by the end of the 21st century.

State of continuous emergencies due to climate change leads to climate-related health risks, zoonotic diseases, and new strains of infectious diseases. Constant crises also lead to better preparation by allocating needed resources for disaster response and emergency treatment.

Our Unwanted Futures

Distress and Disasters (Masakuna)

Technology is advancing, but it cannot keep up and 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, natural resources, human security, and economic growth.

Stronger and more frequent extreme weather events, slow-onset climate change events, such as sea-level rise, drought and ocean acidification, and other disasters including earthquakes, volcanic eruptions, and fires damage properties, endanger lives, and reverse economic gains. Support from the government, non-government organizations, and civil society stakeholders is not enough to alleviate people from distress and disasters.

There is a low capacity to adapt to climate change and prepare for disasters among resource-intensive industries and resource-dependent communities. Communities could not prepare for natural disasters, which causes disruptions in basic services, leaving the grassroots and indigenous communities powerless to defend themselves. Climate change exacerbates environmental degradation—such as air and water pollution, land degradation, deforestation, biodiversity loss, and water scarcity—which worsens the living conditions of marginalized communities and negatively impacts the livelihoods of resource-dependent communities.

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) water-borne diseases (e.g., schistosomiasis and cholera), and (c) heat-related illnesses (e.g., sunstroke, heat stress or exhaustion, and dehydration).

The emergence of agricultural pests and diseases will be more threatening, affecting agricultural productivity and food supply chains. These may jeopardize overall food security, as access to affordable and healthy, nutritious food items will be decreased, leading to malnutrition, thereby affecting people's health and well-being, especially among children.

Human-caused disasters and natural disasters continue to pose a threat to public order and safety. External dangers, criminal groups, and violent extremists may take advantage of our inability to plan for and mitigate disasters in order to foment fear and conflict and gain power and resources. Furthermore, communities that are vulnerable to such occurrences run the risk of being brainwashed, recruited, and radicalized by such groups, jeopardizing our peace and security efforts.

Wider Inequalities (Langit-Lupa)

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.

Companies powered by artificial intelligence are largely unregulated. Artificial Intelligence has started to take over key industries such as finance and digital trade because government policy interventions are too slow and reactionary in addressing black swan or extremely rare events with negative consequences.

Through rapid worldwide advancement in decentralized technologies, unprecedented changes in production, distribution, delivery, and consumption is happening across the globe. At this point, technology rewards the first adopters.

In contrast, laggers and late adopters remain in deep poverty. Instead of addressing challenges for the vulnerable populations, these technological disruptions bring even wider gaps and inequalities—resulting in extreme ends of education, poverty, and wealth.

Advancements in technologies, social 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, worsened situations. The toll undermines social cohesion and foments social, economic, and political instability, which hampers regional and local economic prospects. Public programs that require the participation of all citizens to attain equity, such as social health insurance, will be at risk when the rich refuse to participate.

Due to these worsening conditions, social unrest and political instability emerge. Now powered by the new wave of technology, many resorts to attacking and taking the opportunity from the multiple dimensions of national vulnerabilities such as economy, infrastructure, food, and digital.

Apart from solid defense mechanisms, privacy and cybersecurity are among the serious national security issues in a digitally-altered environment. As a result, wars and conflict may also break out, affecting a large portion of the population and resulting in massive casualties, especially those of the poorest of the poor.

Slow to Change (Mabagal)

There is considerable technological progress, but society has a slow response to stimuli. Solutions are more reactive than proactive. Socioeconomic outcomes have improved while the scars from the pandemic have been addressed, but not as swiftly as international peers.

Bureaucracy, weak institutions, and overregulation stifle creativity and promote a culture of resistance to change leading to obsolete technologies and processes.

Other similar economies have started to benefit from technological advancement. Still, Filipino society struggles to reap benefits from R&D. The newly fostered R&D culture induces greater institutional capacity to generate income for Filipino enterprises and workers. However, there continues to be a high barrier with low support for the entry of innovation champions in certain sectors and industries. Archaic government procurement policies hamper the public sector's innovative and agile action, leading to slow and inefficient business transactions and information processing. Collaboration across government, NGOs, LGUs, industry, academe, and civil society remains limited, in silos, and tends to cover only the short or medium term.

Findings from R&D do not immediately translate into innovative products, policies, and processes. Social capital has not improved, leading to frictions in the adoption of innovations being introduced, including concerns related to data privacy and cybersecurity.

Filipino creativity and innovation are not properly nurtured. The education system and curriculum fail to teach critical thinking, and related skills and competencies for career development. Government institutions are slow to adopt foresight and anticipatory tools and methods.

Extreme poverty and existing inequality have led to a constant but slow movement towards development. Slowly, we address key social and economic challenges through technological innovation but others are faster than we do and our country has been trailing behind.

Our Preferred Futures

Smart and Innovative Philippines 2032

By 2032, the Philippines will have a thriving and competitive innovation ecosystem. It is characterized by these goals: (a) proactive, smart, and innovative people; (b) competitive and resilient economy; (c) collaborative and reliable institutions; and (d) an efficient, clean, and sustainable environment.

Pro-active, Smart, and Innovative People

By 2032, Filipino life-long learners demonstrate high-value 21st-century skills with high regard for the quality of life, inclusive work and entrepreneurship opportunities, continuous human capital development, innovative thinking, research and development, and the use of the intellectual property and intangible assets for development.

Competitive and Resilient Economy

By 2032, the Filipino economy is robust, stable, globally-connected, competitive, and resilient–providing equal opportunities for all through strong and collaborative innovation and entrepreneurship ecosystems.

Collaborative and Reliable Institutions

By 2032, Filipino 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.

Efficient, Clean, and Sustainable Environment

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

AmBisyon 2040

Matatag, Maginhawa, at Panatag na Buhay para sa Lahat

By 2040, Filipinos enjoy strongly rooted family and community ties, a comfortable lifestyle, and a secure future.

Matatag

Filipino families live together; there is a work-life balance so that there is time to spend with family even for members who work. On weekends, families and friends enjoy time together in parks and recreational centers. It is 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 tenure. Families and friends are within reach because transport is convenient and affordable, and they can take a vacation together within the country and abroad. Children receive a quality education so that they realize their full potential and become productive members of society. Decent jobs that bring sustainable income 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, and there are savings. They feel safe in all places in the country. Filipinos trust their government because it is free of corruption and provides service to all its citizens equally.

Innovation Ecosystem

Entrepreneurs

Entrepreneurs are key innovation actors who provide direct and significant contributions to national economic growth. According to the Philippine Statistics Authority (PSA, 2020), 99.6 percent of establishments in the country are MSMEs – 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 for national development.

Scientific Exploration

The ability to innovate builds upon the knowledge generated by scientists, researchers, and technical experts, including students in academic institutions, private and public research and development institutes (RDIs), the scientific community, and other groups that generate knowledge. These institutions lead scientific exploration and knowledge creation through research and development (R&D) as well as blue skies and applied research. These R&D activities provide a mechanism to solve existing and encountered problems by offering scientific and research-based solutions that directly benefit the communities.

Institutions that lead scientific exploration and knowledge creation also provide the foundational knowledge and skills in science, technology, engineering, and mathematics, particularly at the level of basic and secondary education. These institutions also provide training and capacity-building programs for human capital development, and some of these institutions are also home to incubators, laboratories, and research infrastructure that support innovators within or outside their institutions, helping them to transform their ideas into real products and services.

With its infrastructure and human capital development programs, these institutions are critical in ensuring a sufficient pool of innovators and experts who are expected to spearhead scientific and knowledge creation and conduct R&D activities that will lead to the development of more responsive technologies that promote the interest of both the industries and the society.

Technology Development

Building upon the outputs of R&D activities, academic and R&D institutions will then transform theory into tangible products and services. Through technology development, researchers and technical experts combine science and art by employing methods of research, experimentation, idea generation, and validation. Innovators put their time, money, energy, and thought into their

creations and intellectual properties (IP) and the protection of these IPs is important to encourage an environment that will motivate innovators to take action.

In technology development, the government plays an important role in enabling a public policy and regulatory environment that creates the conditions for strengthening academic and R&D institutions to facilitate technology development, encouraging indigenous technological development without unnecessarily stifling private-led innovation efforts, and becoming the primary beneficiary, user, or first customer of innovations.

Technology generators are also starting to consider a market-driven approach to ensure that the product or technology being developed will address the needs of the industry and to ensure that the resulting product or service will be used by the consumers. Market-driven technology development directly links the technology generators to business and market opportunities that will be beneficial for both the institutions and the target beneficiaries.

On a wider scale, innovations would lead to economic growth, the creation of jobs and industries, and the enhancement of the quality and enjoyment of life (WIPO, 2020).

Technology Transfer

Technology transfer is defined as a process to facilitate and expedite the creation and dissemination of technology for the adoption of users. It starts when intellectual property rights (IPRs) derived from successful R&D activities transition from the research laboratory to the marketplace. A smooth and efficient technology transfer process ensures that innovations designed to empower local enterprises are made available to the public.

The technology transfer process involves forging strong partnerships and linkages between technology generators and business entities. This will allow researchers, technology generators, and innovators to systematically transfer R&D outputs to another party through the sale or licensing of IPRs. In academic as well as R&D institutions, the Technology Transfer Officers take the lead in finding suitable technology adopters through activities such as market-matching, business-to-business meetings, and technology pitching.

The successful commercialization of IPRs also involves building strong linkages between the government, RDIs, and industry. Hence, technology generators and researchers in the RDIs must be able to shift from academic-driven to industry-driven R&D activities that will produce innovative solutions to address the most pressing problems of the Philippine industries. This will ensure that IPs generated from such R&D activities are suitable to the needs of the industry and can be readily translated into commercially-viable products and services.

Technology transfer also strives to link technology generators to businesses abroad through diplomatic relations that will unlock business opportunities overseas and achieve international recognition for locally-made technologies. Doing so will require positioning technologies for the

international market through business modeling for foreign economies, IPR protection, and regulatory compliance in foreign markets.

Technology transfer from abroad also serves as an avenue to promote more innovation in the local industries. The Filipino diaspora is able to bring with them learnings from abroad, including knowledge and experiences with advanced and innovative technologies from advanced economies. Foreign industries will also bring with them technologies that can be acquired at various levels apart from the goods and the skills derived that are likewise technology-driven. Therefore, diplomatic relations also play an important role in maximizing technology transfer opportunities for the country.

Overall, a successful technology transfer highlights the need to strengthen linkages among the academe, government, as well as businesses locally and internationally to ensure that R&D outputs will be transformed into commercially-available products and services that will benefit the society.

Market Feedback

Market demand changes through time, and so should technology, and this makes innovation more important. Once a technology goes to the market, it needs to undergo a feedback loop to allow further improvements to adapt to the changing needs or emerging challenges in the market.

Commercialized technologies are adopted by business entities and utilized by consumers. In order to generate feedback, innovators use various tools and methods such as customer satisfaction, social welfare surveys, as well as social media platforms. Innovators use these insights and market feedback to guide decision-making on the improvement or enhancement of products and services based on the needs or preferences of the customers.

Understanding the customer journey will be beneficial to improving the product/service offered. As such, design thinking is crucial in this process as it helps generate human-centered, consumer-oriented, and business-centered innovations. However, entrepreneurs and MSMEs must also be capacitated to ensure that they have the right skills and platforms to generate and gather feedback from their customers. This will enable them to identify the pain points, increase productivity, and continuously improve their products and services. Entrepreneurs and MSMEs can also harness existing social media platforms and advanced communication technologies to widen the reach of market feedback to promote inclusivity.

Market feedback activates data-driven and evidence-based decision-making, opening more opportunities and areas for technical experts to develop innovative solutions that will address the emerging challenges and issues in the market. Social sciences such as psychology and sociology play an important role in this process as it generates a deeper understanding of human-technology interactions. With this, innovation becomes a cyclical process as it begins again with the scientific exploration based on customer insights and goes through technology

development, and technology transfer to address the issues and challenges from market feedback.

Innovation Enablers

Innovation Governance

Innovation governance refers to the institutional set-up of the various elements of the global, national, regional, and local innovation ecosystem. This encompasses the structures and the processes governing policymaking, and implementation, including program delivery, monitoring, and evaluation, as well as coordination, and collaboration, resulting in strong linkages and innovation alliances among public-private sector institutions with relevant stakeholders in the innovation ecosystem. Local and international Innovation alliances forged will provide a participative and collaborative support system for local scientists and entrepreneurs with their overseas counterparts.

As the primary mover in enabling a flourishing innovation ecosystem, the government and the public sector spearhead the creation of systems supporting the needs of the micro-, small- and medium-sized enterprises (MSMEs), startups, and different innovation actors. A whole-of-society approach and strong leadership and political will are required to ensure effective coordination and achievement of this goal. The structure and capacity of the government should also be updated to meet the needs for organizational innovation. Such organizational innovation may include updating of the CSC competency requirements and workplace environment to ensure continuous development of methods in business practices, workplace organization, or external relations. Guided by the Ease of Doing Business Act and ISO 9001:2015 Quality Management System, public sector innovations such as regulatory sandboxing will spur more innovative and useful ways to improve public sector processes, products and services.

Innovation Policy

Innovation policy refers to the laws, standards, regulations, accreditations, programs, projects, and other related action plans by the government with a direct impact on the innovation ecosystems.

Through the Philippine Innovation Act, the NIC is developing the National Innovation and Strategy Document (NIASD) that shall establish the Philippines' vision and long-term goals for innovation and provide a road map and strategies for improving innovation governance and advancement of the innovation agenda of the country. The government is also mandated to implement evidenced-based, data-driven, and inclusive policies and strategies for innovation culture, innovation alliances, the Filipino Diaspora for Innovation, and the removal of regulatory barriers to innovation. The NIC shall also adopt cluster policies and strategies that will promote regional and local innovation. The NIC, through a whole of government approach, will harness the competitive advantages and strengths of each province, region, and community. The government will also intensify existing policies and programs for the protection of traditional knowledge, and cultural expressions through a strong intellectual property management system.

Innovation Infrastructure

The government will allocate sufficient budget, and employ easier public procurement of various instruments such as accessible and reliable technologies, knowledge management platforms, and establish open facilities to support innovation and promote collaboration among innovation stakeholders. The government will also promote investments and competition of local service providers to ensure the availability and affordability of fast internet in the country. The enhancement of physical and digital infrastructure, alongside ICT development will also consider green infrastructure investments and alternative energy saving arrangements.

First, the government shall encourage and support the establishment of more Regional Inclusive Innovation Centers (RIICs) and business incubators to build linkages between the government agencies, academe, research and development institutions (RDIs), and industry stakeholders. These partnerships will foster skills and technology transfer, and create market opportunities.

The Act also mandates the NIC to establish centers of research excellence for multi-disciplinary research agenda and collaborative research activity to encourage relevant agencies to provide research infrastructure in support of key research areas.

Lastly, the NIC is mandated by the law to enable innovation through the use of technology platforms, innovation networks, and other instruments to enable innovation in ecosystems and enterprises. With this, the government should actively partake in anticipating and developing emerging technologies in its services and public administrative systems centered on the needs of the end-users and its stakeholders.

Innovation Financing

Innovation financing refers to a range of government-enabled financing activities and policies such as but not limited to loans, credit, grants, budget disbursement, procurement, incentives, and investments. These allow both public and private entities to raise additional funds as alternative financing to enhance innovation governance, innovation infrastructure, and innovation culture as well as develop innovative enterprises, new technologies, product innovation, process innovation, organizational innovation, and marketing innovation.

The NIC will develop and implement policies and programs to improve and ensure accessibility of financing opportunities for innovative enterprises. First, the Innovation Fund will grant funds to entrepreneurs and enterprises to develop innovative solutions. The Act also mandates the creation of Innovation Development Credit and Financing programs that shall consist of loans and other financing activities to develop new technologies and innovations.

Lastly, the Act mandates all banking institutions, whether government or private, to allocate 4% of their total loanable funds for innovation development credit.

Innovation Culture

Innovation Culture refers to the institutional setup and the environment that cultivates and supports interest in learning, creative thinking, research and development (R&D), technology invention and transfer, innovation, and knowledge generation and management.

The Philippine Innovation Act mandates that the State shall promote a strategic planning and innovation culture to encourage creative thinking and knowledge creation, management, dissemination and utilization. The Act also recognizes the value of the country's traditional knowledge, cultural expressions, and genetic resources as sources of innovation. It shall strive to promote its potential for innovation.

Cultivating a culture of innovation must start from basic education and a young age where experimentation, outside the box thinking, critical thinking and setting the bar beyond the reasonable are encouraged among the youth and innovators. Inculcating a culture of innovation must also be made available to the grassroots and indigenous communities. Continuing this culture to higher stages of education is crucial in developing a new generation of Filipino lifelong learners that contribute to high-impact innovation.

Innovation Priority Areas

People Cluster

Learning and Education

Innovations that enable the effective delivery of inclusive, quality lifelong learning, allowing learners to acquire functional literacy, knowledge, skills, values, beliefs, and habits towards more proactive, productive, smart, and innovative people.

This includes improving the teaching and learning environment, learning equipment and platforms, continuing professional and learning development, curriculum design, and pedagogy, among others.

Health and Well-Being

Innovations that ensure affordable, smart, equitable, quality responsive, accessible, and comprehensive healthcare and total well-being services products, and solutions.

This includes engaging and informing individuals and groups about informed health decisions, participating in decisions affecting their health, averting health risks, and protecting them from consequences of ill-health to promote and improve health outcomes for all people.

Economy Cluster

Food and Agribusiness

Innovations on interconnected value chains including agricultural extension and support services in food, agriculture, forestry, fisheries, and other related industries that ensure food security and ensure proper nutrition that is affordable and accessible to the communities, while empowering local producers.

This includes smart agricultural inputs, improving production efficiency and mechanization, cost-effective post-harvest handling, processing, logistics, marketing, distribution, and consumption of agribusiness products and services.

Finance

Innovations that facilitate smart, inclusive, interoperable, efficient, and secure financial services.

This includes innovative platforms for financial literacy and advisory, innovations in digital and open finance, data-driven financial solutions, and cross-border innovations on financial products and services.

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.

Manufacturing innovations 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, and customer service, among others.

Transportation and Logistics

Innovations that ensure efficient, seamless, inclusive, safe, and secure physical movement or mobility of the flow of goods and people to the desired location while reducing carbon footprints from the sector.

This includes the 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, and enhancements in land-use and transport interaction in urban planning, and logistics management, warehousing, and storage, among others.

Institutions Cluster

Public Administration

Innovations that empower participatory governance to ensure collaborative, people-centered, reliable, accountable, and efficient government institutions.

This includes enhancements and integration of innovation and anticipatory policy planning, citizen participation, administration of justice, digital transformation and e-governance, transparency, public procurement, and improvement of public service delivery of national government agencies and local government units, among others.

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.

This includes improvements in law enforcement, cybersecurity, public health security, disaster response and relief, peace and development interventions, defense capabilities and material of the Armed Forces, and maritime and air domain awareness monitoring, among others.

Environment Cluster

Energy

Innovations towards achieving energy security in the country while ensuring efficient, clean, and sustainable extraction, production, refinery, processing, distribution, sale, and consumption of sources of energy.

This includes innovations 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 sources.

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 marine and freshwater ecosystems.

This includes the sustainable fish- and marine-based industries, green maritime transport industry, sustainable tourism, ocean energy, sustainable management of freshwater resources and innovative solutions to improve water quality according to intended uses such as food production, recreation, and sanitation.