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Contribution by Philippines

to the CSTD 2022-2023 priority theme on “Technology and innovation for cleaner
and more productive and competitive production”

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Inputs from the Department of Science and Technology | Philippines

PRIORITY THEME 1: Technology and innovation for cleaner and more productive and competitive production

1. What are some specific examples (from the public and private sectors) of green technology and innovation for cleaner and more productive and competitive production in your country? Please include contact, website, link to reports and any other relevant information concerning these projects and initiatives.

The Department of Science and Technology (DOST) conducts initiatives that promote cleaner and more competitive production in the Philippines. Through its attached agencies, the DOST has supported and developed green technologies, implemented activities, and extended technical assistance and advice in support of this venture.

Green technologies

- The DOST, through its attached agency, the Industrial Technology Development Institute (DOST-ITDI) developed Technologies for Plastic Alternatives and Recycling. These are biodegradable thermoplastics starch-based plastics, Chitosan-based Green Packaging, Bacterial cellulose Packaging, Indigenous and renewable materials, and bioplastics from agricultural wastes. Recycling technologies include recycling production of plastic composites: commingled plastics for plastic panels or tiles products, natural fiber-thermoplastic composites, recycling/processing of Waste Styro/Sandobags using ITDI's styro/plastic densifier, and waste plastic to fuel technology.
- The DOST's National Capital Region office also funded the development dual drum composter that can be used in barangays (local communities) to process 100kg of biodegradable wastes into soil conditioner. This is a smaller scale version of the DOST Bioreactor which processes 500kg to 1 ton of biodegradable wastes. Both technologies are rolled out to communities.
- The DOST through its Technology Application and Promotion Institute (DOST-TAPI), assisted green technologies through the Technology Innovation and Commercialization (TECHNICOM) Program and the Venture Financing for Environmentally-Sound Technologies (VFEST) Program. Some of which include a fish monitoring system that gathers accurate and high-quality data, microwave pectin, abaca boat, nanozeolite, rapid charging system used to charge electric vehicles, cost-efficient and environment-friendly sustainable construction material called "Po-lite", water battery technology with a twin purpose of energy generation and environmental protection, natural-fiber thermoplastic, solar panel system used for production of pastries, channel digester hybrid biogas system, and wastewater treatment.
- The DOST's Region IVB Office, through its Provincial S&T Office in Marinduque led the 6M-project on the deployment of Solar Energy Systems (SES) to 29 Rural Health Units (RHUs) regionwide. Also, DOST Marinduque office serves as a demonstration area for "green building" using solar energy systems. As a result, different government agencies in the province signified interest in adopting SES.
- Lastly, biogas technology is being harnessed to provide alternative waste abatement systems and renewable energy sources for livestock farms in Oriental Mindoro. Instead of allowing methane to contaminate the ozone layer, it was being collected efficiently

and used primarily for cooking purposes allowing fuel savings for the technology adopters. It is also a good source of biodegradable liquid and solid fertilizers for farm crop production.

Activities for cleaner and more productive and competitive production

- The DOST-ITDI, in cooperation with the Institute of Agro-Products Processing Science and Technology, Shandong Academy of Agricultural Sciences (SAAS), P.R. China, conducted R&D on green oil from cashew under the Joint Commission Meeting on Science & Technology between the Department of Science and Technology of the Philippines and the Ministry of Science and Technology of China as one of the cooperative areas. Joint R&D efforts will strengthen and improve the cashew in the Philippines, accelerating economic growth, social progress, and cultural development. The collaboration of both countries will result in stronger international linkage and networking.
- Also known as "Niche Centers in the Regions for R&D" or NICER, these R&D centers under the Department's Science for Change Program ¹(S4CP), will focus on sectors related to Health and Industry, Energy, and Emerging Technology to allow the country's academic and R&D institutions to upgrade their research facilities, develop policies, transfer technologies, and ramp up regional initiatives and efforts towards a competitive innovation ecosystem.
- Through these R&D centers, the DOST cultivates the innovation landscape in various sectors to ensure no one is left behind in R&D progress

Technical assistance and consultancy

- The DOST-ITDI, in coordination with DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD), has conducted cleaner production assessments and energy audit. It also partnered with the Philippine Institute of Chemical Engineers (PIChE) to run a training program on resource-efficient and cleaner production (RECP) assessment to build up a mass of sustainability engineers for PIChE. The services of both divisions may be seen on the DOST-ITDI website at www.itdi.dost.gov.ph. Activities of PIChE may also be viewed at www.pichenet.org.
- The DOST, through its National Capital Region (NCR) office, provides technical consultancy on Resource Efficiency and Cleaner Production (RECP) as well as Manufacturing Productivity Extension (MPEX) Program to drive the use of resource efficient and eco-friendly technologies. Said services are provided nationwide by the DOST Regional Offices. Interested industry players can also connect to experts on the said topics through the DOST OneExpert Portal at <https://oneexpert.gov.ph/>.

2. What are the national strategies, policies, and laws concerning green technology and innovation for cleaner and more productive and competitive production in your country?

Environmental regulations in the Philippines include prioritizing source reduction and recycling over treatment and disposal in terms of waste management. These apply to regulations such as the:

- Philippine Clean Air Act or RA 8749
- Philippine Clean Water Act of 2004 or RA 9275
- Toxic Substances and Hazardous and Nuclear Wastes Act of 1990 or RA 6969
- Ecological Solid Waste Management Act of 2000 or RA 9003

¹ Science for Change Program is a recipient of the 2022 United Nations Public Service Award <https://businessmirror.com.ph/2022/06/26/dosts-s4cp-is-game-changer-in-phl-innovation/>. More details about the Program at www.s4cp.dost.gov.ph

In addition, the country also has regulations which promote the use and development of renewable energy and biofuels:

- Renewable Energy Act of 2008 or RA 9513
- Energy Efficiency and Conservation Act of 2019 or RA 11285

Other laws related to cleaner and more productive and competitive production in the country are the (i) Green Jobs Act of 2016 or RA 10771 that promotes sustainable growth, creates decent jobs, and builds resilience against climate change through incentives to businesses generating green jobs and (ii) Organic Agriculture Act or RA 10068 which was amended as RA 11511 that aims to promote, propagate, develop further and implement the practice of organic agriculture in the Philippines in order to enrich the fertility of the soil, increase farm productivity, reduce pollution and destruction of the environment and prevent the depletion of natural resources.

Aside from the regulations mentioned above, there are also research and development projects being supported by the DOST in line with green technology and innovation

- Machinery for Decontaminating Rice Hull as Litter Floor for Broiler Breeder Production
- Black Soldier Fly (BSF) farming for agricultural productivity and waste management
- Development of nanofertilizer from poultry waste biogas digestate
- Extraction of Phytohormones from Waste Coconut Water using Biochar Derived from Agricultural Residues

Other projects:

- Clean Energy – ALERT (Alternative Energy Research Trends). This program of the DOST-National Research Council of the Philippines (NRCP) aims to investigate alternative energy sources in the Philippines. The challenge is clear and daunting. As the Philippines continues to modernize and industrialize, its energy needs are expected to double over the next 20 years. The challenge is to meet these needs while trying to stem accelerating greenhouse gas emissions (GHGs) that contribute to climate change. Thus, research on cleaner energy sources is very important. Above all, this program will lay out how renewable energy can save the government money, bring jobs to the country, create wealth, expand access to energy for the most vulnerable in poor communities, and foster national energy independence (<https://sdg.neda.gov.ph/clean-energy-alert/>).
- Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP). The Philippine Action Plan for SCP (PAP4SCP) will serve as a guiding framework to influence and steer sustainable behavior and practices across sectors and levels of government by implementing programmatic policy reforms and set of actions over the short- (2020-2022), medium-(2022-2030), and long-term (2030-2040) (<https://sdg.neda.gov.ph/philippine-action-plan-for-sustainable-consumption-and-production-pap4scp/>)

Lastly, the DOST is pushing for the passage of the Science for Change Bill which provides programs for the establishment of research and development (R&D) centers, as well as collaborative R&D between the academe and the industry. This initiative bolsters the productivity and competitiveness of industry players, and drive R&D on renewable forms of energy and green technologies.

3. What are the key industries that are pioneering green innovation in the country? List the key actors in the national ecosystem of innovation related to green innovation in your country (firms, universities, financial institutions, regulators)? What are the key networks

of the ecosystem in your country (including online networks, innovation hubs, forums, etc.)?

Key industries pioneering green innovation are the Department of Science and Technology and its attached agencies, academia, research institutions and consortia, private sector, NGOs, and the government agencies. In many cases, the government such as the DOST provides funding to projects and initiatives that support green innovation.

- Government: Department of Science and Technology, Department of Environment and Natural Resources (also a regulating body), Department of Agriculture, Department of Agrarian Reform, Department of Trade and Industry, and Department of Education for the integration of the subject in education curriculum
- Academe: (State) Universities and Colleges such as the University of the Philippines Los Baños (UPLB), Batangas State University (BSU), Central Luzon State University (CLSU), Hydroponics and Aquaponics Technology Demonstration, Isabela State University (ISU), Bulacan Agricultural State College (BASC), and De La Salle University (DLSU)
- Non-Government Organizations (NGOs) and the Society: Greenpeace, Philippine Partnership for Sustainable Agriculture (PPSA), Organic Agriculture Society of the Philippines (OASP)
- Private sector: MSMEs, private farms, farmer representatives, cooperatives

More particularly, an example is the implementation of several cleaner production projects of DOST-ITDI where several food manufacturing establishments participated in. The country is dominated by small and medium enterprises (about 99% of industries), and food processing is the most dominant sector. Thus, there are more participants from this specific industry. Agro-industries also participated in the projects such as poultry dressing plants, slaughterhouses, pig farms, and other meat establishments.

4. What are the challenges that your government have faced or may face in promoting green technology and innovation in your country to contribute to national development priorities and accelerate the progress towards the SDGs?

Promoting green technology in the Philippines is challenging in terms of cost efficiency, especially for MSMEs. As there are only a few manufacturers of green technologies, supply is less, thus the available green technologies (including storage of energy and solar cells/panels) cost more.

In the private sector, although gains had been made through implementing good housekeeping practices (about 70% of cleaner production options in assessed companies fall under this category), investments in more innovative and cleaner production technologies have yet to be fully realized. Even before the onset of the pandemic, industries need financial resources to make such investments. Another concern in adopting green technologies and innovation is the potential that could lead to the displacement of workers.

In the field of organic agriculture, there are high certification costs of organic products and maintenance of facilities for green technologies. Sustainability of promotion and advocating for green innovation is yet to be improved. Another challenge experienced are some complications in transferring technologies from R&D institutions to industry manufacturers and fabricators.

All of these challenges contribute to the slow adoption of green and innovative technologies in the country.

5. What should governments, the private sector, organized civil society, and other stakeholders do so that developing countries can benefit from these technologies?

All stakeholders that benefit from these technologies must ensure that the social aspect of sustainable development is always considered. Constant consultation amongst all these stakeholders is necessary to ensure that all potential consequences would be beneficial. The challenges and appropriate strategies in implementing these technologies must also be considered. The academe-industry-government collaborations should be enhanced so that technologies created can benefit industries outright.

The government, with support of other stakeholders, should continue to craft and expand its national policies to further promote the application and utilization of green technologies. This could be done by incentivizing through financial grants, subsidies, and tax reliefs, the users of green technologies to encourage them to produce more. Services to support these activities could also be extended by the government and other relevant agencies.

Moreover, there is a need to campaign for technology transfer and use of these technologies. Green technology subjects could be institutionalized in basic education to create awareness on sustainable development.

Finally, capacity building activities are needed to upskill and prepare the manufacturing sector to adopt technology outputs from research and development institutes.

6. What are some examples of international cooperation mechanisms, projects, programmes or strategies, including triangular and South-South cooperation, in green technology and innovation that your country is part of?

Significant international cooperation can be learned from DOST-ITDI's partnership with Canada's International Research and Development Center (IDRC), Australian-ASEAN Economic Cooperation under the Australian Agency for International Development (AusAID), and Japan's International Cooperation for Environmental Technology Transfer (ICETT) molded the current efforts in cleaner production, in addition to these internal cooperation projects, the United States Agency for International Development (USAID) funded Industrial Environmental Management Project (IEMP) and the United Nations Industrial Development Organization (UNIDO) project on Private Sector Participation in Managing the Environment (PRIME) were also trailblazers in promoting green technology and innovation. The United Nations Environment Program (UNEP) also contributed greatly to the GERIAP Project's success in 2003 on cleaner production and energy efficiency for key industries such as cement, chemicals, ceramics, and pulp & paper.

In September 2021, the DOST met with The United Nations Philippines SSTC consultant to strengthen South-South and Triangular Cooperation and to discuss and identify the strategic opportunities of the country in science, technology, and innovation (STI). As discussed in the meeting, the Philippines' science, technology, and innovation (STI) strengths are food processing and innovation, agriculture, and waste management. The various priority areas of the DOST under the DOST Agenda 2017-2022 are health sufficiency, food and nutrition, agriculture, biodiversity, transport and mobility, industrial manufacturing, creative industry, renewable energy, OneLab, and OneSTore. The Philippines can also benefit from SSTC. The preferred modalities of cooperation of the DOST and areas where it can explore more and learn more about our artificial intelligence (AI), industrialization/Industry 4.0, and nuclear science research, especially for medical

applications. DOST would remain committed to contributing to the success of the UN's initiative in SSTC, and the Department will continue cooperating with the UN Country Team in the Philippines to establish the SSTC facility (bit.ly/UN-PH-SSTCMtg).

The Department of Science and Technology (DOST) hosted the EU-ASEAN Webinar Series on GreenTech and Innovation Mapping Dialogue: Green Technologies for Plastic Value Chain Management supported under E-READI, in close cooperation with the European Commission Directorate-General for Research and Innovation (DG RTD).

7. What actions can the international community, including the CSTD, take to help your country take advantage of green technology and innovation for cleaner and more productive and competitive production?

The international community, including the Commission on Science and Technology Development, could create and implement interventions to make green technology and innovation more affordable to developing countries. The international community could subsidize these technologies or consider green accounting in calculating the return on investments for the greater good of the entire planet. Support in research and development, technology transfer, and maintenance and long-term sustainability of these technologies and innovations are also necessary. Capacity building and training may also be conducted and sustained to ensure appropriate and continuous implementation of green technologies. Lastly, the UN and the international community may utilize these multilateral platforms to provide opportunities for benchmarking and campaign for policy provisions in the use of green technologies and innovations. Implementation of policies, provisions, and impositions of the treaties/ agreements under the United Nations Framework Convention on Climate Change, especially the Kyoto Protocol on carbon sequestration and carbon market should be strengthened.

8. Could you suggest some contact persons of the nodal agency responsible for projects/policies and international collaboration in this context as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further input or invite some of them as speakers for the CSTD inter-sessional panel and annual session.

- DOST Office of the Secretary – osec@dost.gov.ph
- Dr. Leah J. Buendia, DOST Assistant Secretary for International Cooperation – leahbuendia@yahoo.com; oasec.ic@dost.gov.ph

9. Do you have any documentation, references, technological assessments, future studies or reports on the priority theme in your country or region?

The DOST released the PAGTANAW 2050 or Foresight 2050, crafted by academicians and national scientists. The document serves as the nation's Science, Technology and Innovation (STI) Foresight and Strategic Plan to harness S&T towards the achievement of a preferred future in the context of a maritime nation. The DOST also has the Harmonized National R&D Agenda 2022-2028 (HNRDA) which include green technologies and renewable energy as part of the priority.

The DOST-ITDI has more than sixty (60) cleaner production assessment reports prepared during the time of the Integrated Program on Cleaner Production Technology and a DOST flagship program started in 2000. Likewise, DOST-ITDI has had over three hundred (300) energy audit reports for large industries and MSMEs since 2001. Aside from this, DOST-ITDI has guidance documents on the following topics:

- Use of alternative fuel and raw materials in cement kiln co-processing
- Improved operating practices in the manufacture of muscovado sugar

- Training manual on cleaner production
- Environmental management plans for small- and medium-scale meat establishments
- Best available technologies and best environmental practices for meat establishments
- Cleaner production and sustainable technology case studies from APEC economies with economic analysis and interpretation
- Philippine ETV compilation of verified environmental technologies
- Environmental management system, pollution prevention/cleaner production, and environmental cost accounting

Plans are also underway to revive the cleaner production program within DOST. Currently, energy audits/assessments are being conducted by CED for local government units under the Government Energy Management Program (GEMP) with funding from the Department of Energy (DOE).