



CHAPTER 20

Science, Technology and Innovation Statistics

Introduction

Science, technology and innovation (STI) are key to the country's economic and social progress. Traditionally, STI is viewed as sources of new knowledge, products, and services that benefit the economy and society. In recent years, STI is increasingly viewed as key solution providers towards addressing many of society's challenges, such as speeding up industrial development, promoting sustainable agriculture, developing renewable energy, reducing and managing disaster risks, addressing impact of climate change, and narrowing social and economic gaps.

The level of scientific and technological reception and diffusion is generally considered as an important factor that defines the social and economic divide between developed and developing countries. In more progressive nations, science and technology (S&T) is ingrained in the educational and governance systems which makes easier for technological advances to find their uses in homes and industries. In developing countries like the Philippines, more efforts are needed to increase generation of new knowledge and to facilitate transformation of knowledge into productive uses. Stronger advocacy, increased technological literacy through education and training, better policies, and more investments are therefore, crucial.

In line with the Philippine Development Plan (PDP) 2017-2022, the STI sector commits to contribute in the achievement of the overall goal by promoting and accelerating technology adoption and

stimulating innovation in the agriculture, industry and services sectors as well as investments in technology-based start-ups, enterprises and spin-offs that will result to the promotion and acceleration of technology adoption. The STI sector will also enhance the creative capacity for knowledge and technology generation, acquisition and adoption as well as strengthening open collaboration among actors in the STI ecosystem in order to stimulate innovation. This is outlined in Chapter 14 of the PDP 2017-2022, "Vigorously Advancing Science, Technology and Innovation". Moreover, the implementation of the strategic plan, Science for the People (SFTP) 2017-2011, will address challenges in key result areas of Research and Development (R&D), technology transfer, human resource development, S&T innovation and promotion, information dissemination and advocacy, and networking.

A sound and comprehensive information base on the country's flows and stocks of scientific and technological resources is critical in monitoring progress of STI goals and in guiding the formulation of more effective S&T policies and programs that optimize the benefits of STI in a knowledge-based economy.

This chapter aims to strengthen the STI statistical data system to address information needs for the monitoring and evaluation of STI goals and targets in the PDP and SFTP and other emerging development concerns.

❖ **Scope and Coverage**

This chapter deals with statistical data and indicators that measure and monitor activities and developments in the STI sector. The statistical framework for the development of STI statistics is based on the STI sector development process as follows:

- R&D Expenditures
 - Research and development expenditures by sector (government, higher education, private non-profit and private industries) and by region
 - R&D expenditures as share of Gross Domestic Product (GDP)
 - R&D expenditures of business enterprises
- S&T/R&D human resources
 - R&D human resources by sector (government, higher education, private non-profit and private industries) and category of R&D personnel
 - Profile of researchers (age, gender, educational attainment)
 - Researchers per million population
 - Student enrolment in Science, Technology, Engineering and Mathematics (STEM) in higher education institutions
 - Graduates in STEM in higher education institutions
 - Scholarships in S&T (Republic Act No. 7687, Engineering Research and Development for Technology (ERDT), Accelerated Science and Technology Human Resource Development Program (ASTHRDP))
 - Employment of S&T professionals
 - Tracking Actual Career Experience Report (TRACER)
- S&T Products
 - Intellectual property rights granted/registered (patents, utility models, industrial designs, copyright)
 - Scientific publications in international scientific indexing (ISI)/Scopus Index Journal by Filipino authors
- S&T Competitiveness and Innovation Indicators

- World Intellectual Property Organization (WIPO) – Knowledge and Technology Outputs percentile ranking
 - WIPO - innovation percentile ranking
 - World Economic Forum (WEF) – Global Competitiveness Report (GCR) Innovation percentile ranking
 - WEF-GCR Technological Readiness Percentile Ranking
 - Global Innovation Index (GII)
- S&T Collaboration
 - WEF University-Industry collaboration (percentile ranking)
 - Collaborations between HEIs and industries
 - Collaborations between HEIs and government (NGAs and LGUs)
 - STI-related international cooperation of higher education institutes (HEIs)
 - Socio-economic benefits of STI
 - Gross value added (GVA) in high technology agriculture, industry and services
 - Private agricultural forestry and fisheries and industry and services R&D (as proportion to GVA)
 - Small Enterprises Technology Upgrading Program (SETUP) – assisted micro, small, and medium enterprises (MSMEs)
 - Technology Business Incubators (TBIs) graduates (i.e. enterprises and spin-offs)*
 - Innovation hubs established (e.g. TBIs, innovation centers, niche centers, etc.)
 - Sustainable Development Goals (SDG) - based indicators related to STI

❖ **Implementing Agencies**

- Interagency Committee on Science, Technology and Innovation Statistics (IACSTIS)
 - Department of Science and Technology (DOST) – Planning and Evaluation Services (PES)
 - DOST – Science Education Institute (SEI)
 - Philippine Statistics Authority (PSA)
 - Intellectual Property Office of the Philippines (IPOPhil)
 - Commission on Higher Education (CHED)

- Department of Trade and Industry (DTI)
- Philippine Institute for Development Studies (PIDS)

Milestones, Key Developments, Issues and Challenges

❖ Milestones and Key Developments of 2016-2017

- Conduct of the 2015 Survey on Innovation Activity of firms in the Philippines
- Conduct of the 2015 R&D Survey and generation of regional level data in partnership with the DOST regional offices
- Collection of data on Government Budget Allocation on R&D or GBAORD for 2015, 2016 and 2017 using the Unified Accounts Code Structure prescribed by the DBM
- Inclusion into the DOST website of data on R&D statistics, Global Innovation Index and other WEF-based indicators including socioeconomic updates on the STI ecosystem
- Inclusion of scholarships on Statistics course in the Science Education Institute's scholarship
- Close coordination with the IPOPhil to generate statistics on patents, utility models and industrial designs
- Generation of data on enrolment and graduates in STEM courses
- Publication of Migration of Science and Technology Professionals: Temporary and Permanent Migrants 1998-2013
- Collection of secondary data and dissemination of statistics on socioeconomics - related updates as environmental scanning services for management information and as basis for policy decisions
- Generation of S&T-relevant WEF-based indicators such as technology-readiness, global competitiveness report, university-industry collaboration percentile rankings for management information
- Conduct of regional fora on the 2013 R&D survey results
- Development of Directory of R&D institutions in the Philippines (government, HEIs and private non-profit institutions)
- Creation of Regional Statistical Committees which helped identify core regional indicators including S&T indicators

❖ Issues and challenges

Among the key issues and challenges in the development of STI statistics are as follows:

- Weak monitoring of activities indicated in the previous Statistical Development Plans
- Fast turn-over of people knowledgeable in statistics
- Weak collaboration on STI statistical data needs among concerned government agencies, LGUs, academe and industries
- Risk of redundancy of data collection/generation due to poor coordination among government agencies
- Limited data and indicators
- Innovation, specifically in business/industry and government sectors
- Measuring STI development goals
- Compilation of R&D satellite accounts
- Delayed return of data collection instruments and low response rates on the National Survey of R&D Expenditures and Human Resources
- Insufficient STI data and information which leads to sub-optimal STI-related policy decisions
- Need to improve data reporting or responses to statistical inquiries to improve STI statistics
- Need to disseminate and generate both national and local-level STI statistics and indicators
- Limited number of statisticians or personnel with technical know-how on data processing and analysis
- Poor international STI-related rating of the country due to lack of data on STI, e.g. Global Competitiveness Index

Key Statistical Development Programs and Activities

❖ Thrusts and strategies

For the period 2018-2023, the following thrusts shall be pursued for science, technology, and innovation statistics:

- Enhancing the management and coordination of the agencies to ensure progressive and sustained improvement of STI-related statistics

- Improving current methodologies for the generation of statistics and indicators to respond to the current and emerging concerns, needs, and demands
- Strengthening capacity building for improvement in the production, dissemination, and utilization of STI-related statistics

The strategic plans of the Philippine Statistical System (PSS) are to: (a) invest in the necessary statistical infrastructure, resources, and programs that will help to improve the generation, dissemination, and utilization of the STI-related statistics; (b) conduct more consultation workshops and user's fora to enhance appreciation of STI statistics; and (c) enhancement of the partnership with the international statistical community through adherence to international commitments such as the SDGs.

❖ Major Statistical Development Programs and Activities for 2018-2023

The following are the strategic measures that will be undertaken towards the development of the STI data system:

a. New Developmental Programs and Activities

- Development and compilation of R&D accounts
 - Review of data requirements and system of collection
 - Compilation of methodology
- Development of a unified STI Statistics Web Portal for PSS to consolidate and disseminate all available relevant STI data and information
 - Establishment of a harmonized STI data archive/warehouse system
- Development and dissemination of information, education, and communication (IEC) materials of STI statistics
 - Creative dissemination of IEC materials on STI statistics through infographics and audio-video presentation (AVP) clips through social media
- Conduct of statistical advocacy and appreciation programs
 - Conduct of appreciation forums for data providers to increase data reporting or improve response to statistical inquiries
 - Conduct of appreciation seminars and training on the rational use of STI statistics

- Conduct of dialogue/consultative forums among STI data producers, providers and users, including planners and policy makers, media and other stakeholders from local and regional institutions for the improvement of STI statistics
- Conduct of media briefings/press conferences on important STI data/product releases

- Participation in international cooperation activities on STI statistics and indicators
 - Provision of country data and inputs to international inquiries and requests
- Conduct of study/ies on indicators to measure STI development goals
- Conduct of regular training on statistics and related course for personnel engaged in the collection, management, reporting, dissemination (e.g., infographics), and analysis of STI statistics
- Formulation of advocacy programs to promote the statistics profession and increase supply of human resources in the PSS
- Formulation and implementation of policies, standards and programs in generating and disseminating both national and local-level STI statistics and indicators
 - Formulation of standard concepts and definitions for statistical purposes consistent with international recommendations
 - Adaption/implementation of international principles, frameworks, and declaration on STI statistics
- Implementation of a data quality assurance framework for STI statistics
- Upgrading of information and communications technology (ICT) resources to support automation of collection, processing and dissemination of STI statistics consistent with agencies' Information Systems Strategic Plan

b. Building-up Current Efforts

- Improvement of existing STI surveys and conduct of new ones to generate specific data needs, e.g., Results Matrix (RM) of the PDP and SDGs
 - Regular conduct of Survey on Innovation for business/industry and government sector

- Conduct of surveys using innovative technologies, e.g., web-based surveys or use of online questionnaires
- Enhancement of administrative reporting forms of STI institutions for the generation of STI statistics and indicators
 - Improved collection of administrative-based STI data
- Participation in and hosting of relevant international conferences, training, workshops, and expert group meetings on STI statistics and indicators
- Enhancement of statistical framework for STI to consider emerging developments
- Strengthening of institutional coordination for improvement of STI statistics
 - Establishment of a mechanism for IACSTIS to effectively and efficiently collaborate STI statistical data needs and related concerns to all stakeholders
 - Establishment of a committee or sub-committee to monitor the Plans/Activities