MONITORING AND EVALUATION THE IMPLEMENTATION THE STRATEGY AND POLICY ON SCIENCE, TECHNOLOGY AND INNOVATION IN SOME COUNTRIES IN THE WORLD

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Summary:

Monitoring and evaluation the implementation of science, technology and innovation (STI) strategy and policy is an important task, which contributing to ensuring that the implementation of programs, projects, policy and strategy is implemented effectively and sustainably. The monitoring and evaluation framework is a tool designed to guide the implementation of monitoring and evaluation functions during the implementation of strategy and policy in order to improve the effectiveness of the implementation of strategies and policies in practice, meeting defined objectives. This article reviews experiences in monitoring and evaluating the implementation of STI strategy and policy in some countries, thereby suggesting some lessons learned for Vietnam.

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According to the Monitoring and Evaluation (M&E) Manual of the Evaluation Office of the United Nations Development Program *(UNDP 2009)*, monitoring and evaluation is a continuous monitoring process to obtain information feedback from stakeholders on progress in achieving the goals of programs, projects, strategies and policies, and at the same time, find new solutions that need to be implemented to ensure progress in implementing the direction to the identified results and goals, thereby contributing to decision-making to promote the quality of programs, projects, strategies and policies. Thus, monitoring can be considered an activity or process with the external objective expression of "surveillance", "observing", "reviewing", "evaluating" the subject being monitored and information obtained from the monitoring process will be sent to the competent authority to propose appropriate management measures and solutions. Monitoring is a proactive, regular, and continuous action of the monitoring subject to the monitored object. During the monitoring process, there is always the collection, and analysis of data, reporting information on the activities of the monitored object and comparing, commenting, and evaluating the appropriateness of the monitored object's activities according to the plan, and predetermined goals...

Evaluation is the use of criteria, and indicators to measure activities, programs, projects, strategies, and policies according to set expected goals, and at the same

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time evaluate the appropriateness, and effectiveness, and performance, impact, and sustainability of the implementation process of those programs, projects, strategies, and policies. There is a close relationship between monitoring and evaluation, complementarity, and mutual dependence. Monitoring information raises questions that need to be answered by evaluation and, conversely, evaluation information provides about the need to monitor new areas or activities. Evaluation will provide input information for monitoring activities, based on which to make comments and assessments on the process of implementing strategies and policies and have appropriate behaviors in implementing strategies and policies to improve the effectiveness of strategies and policies. Thus, monitoring and evaluation are two activities that are closely related, support and complement each other and cannot always be clearly separated in the entire monitoring and evaluation process.

Countries around the world have widely used monitoring and evaluation tools for STI strategies and policies and that are conducted periodically according to management requirements. Monitoring and evaluation are management tools of competent authorities. For each field of activities, the monitoring and evaluation framework is designed to suit the nature and characteristics of that field and has the same goal of improving the quality and effectiveness of implementing strategies and policies to achieve goals, or target has been determined.

1. Monitoring and evaluating the implementation of science, technology and innovation development policies through monitoring and evaluating the European Union's Horizon Europe Program

1.1. Introducing the Horizon Europe Program

The Horizon Europe program is a leading research and innovation program of the European Union (EU) aimed at promoting scientific research, innovation, technology development and solving urgent social challenges in the period from 2021 to 2027. Program for innovation researchers, focusing on climate change issues, sustainable development goals, innovation policy support, and solving global challenges, promoting technological excellence. This is an opportunity to learn, to connect and to share information to help young researchers and businesses join the scientific community. One of the pillars of the Program is scientific excellence, aiming to consolidate and expand pioneering research's educational institutions, where the best research councils, famous scientists, and many big businesses participates. Scientists can come from many industry groups such as culture, electronics, bio economics, agriculture, environment,...

Horizon Europe succeeds its predecessor, Horizon 2020, and represents the EU's commitment to promoting excellence in research and innovation. The program is structured around three main pillars: (1) Scientific excellence, supporting basic research with the aim of strengthening Europe's position as a global research hub; (2) Addressing global challenges and the competitiveness of European industries, focusing on addressing sustainable development challenges and supporting the improvement of European industrial

competitiveness; and (3) European innovation to promote innovation, create conditions for technology transfer and encourage startups. The program supports initiatives that help transform research results into marketable products, services and technologies that contribute to economic growth and job creation.

The Horizon Europe program encourages the active participation of academia, industry, research organizations and other stakeholders to jointly address complex challenges and create a positive impact on society. The Program will maximize the EU added value by focusing on objectives and activities that cannot be effectively delivered by Member States alone but can only be delivered through cooperation. The Program's funding is allocated through a competitive selection process, ensuring that the best projects receive financial support from the EU. Horizon Europe encourages open access to research results and recommends the dissemination of knowledge to maximize social and economic benefits. Through Horizon Europe, the EU wants to promote the research and innovation system, enhance global competitiveness, and contribute to build a sustainable and prosperous future for Europe and the world.

With such a large-scale goal, the Horizon Europe Program has been implemented with regular monitoring and evaluation by competent authorities.

1.2. The role of the Horizon Europe Program monitoring and evaluation framework

To conduct monitoring and evaluation of the Horizon Europe Program, a monitoring and evaluation framework has been designed to monitor, evaluate, and track the performance, progress and impact of activities and projects and Program initiatives. Using a monitoring and evaluation framework, it helps ensure that the Program's objectives are being implemented effectively and efficiently and provides information to support decision-making, and regulating, and adjusting and improving policies. The goal of the monitoring and evaluation framework is to provide valuable evidence into the policy cycle, through data and indicators. At the same time, the data and indicators provided will be evidence to support the design phase of component programs, long-term strategic plans, etc. The data and indicators allow for rapid policy adjustments to maximize the effectiveness of investments from the EU. These are data and indicators that help systematically monitor the progress of Horizon Europe's activities, including inputs, outputs, and outcomes/impacts of the Program. This is one of the main sources of information on the Horizon Europe assessment. The monitoring and evaluation framework uses data collected from different sources such as interviews, surveys, case studies, etc.

The monitoring and evaluation framework will provide data and indicators to serve the following purposes:

Support the Program's performance and progress measurement in implementing the Program's overall and specific goals. Helps monitor program implementation and performance and provide early warning of possible deviations.

Evaluate the relevance, thoroughness, and implementation efficiency of the Program.

Widely communicate to the public about the impact and diversity of benefits that the Program brings. Monitoring and evaluation will help maximize the scientific, economic, and social impact of the Program, by illuminating performance during and after implementation.

Provide information to support policymakers and managers in designing evidence-based policies and making appropriate decisions during Program implementation.

1.3. Organizations involved in monitoring and evaluating the Horizon Program

The Horizon Europe program is an international program, so many organizations participate in the monitoring and evaluation process, including the following organizations:

- *European Commission:* Is the governing body of Horizon Europe. The European Commission plays a central role in designing and implementing the framework for monitoring and evaluating the Program's performance and impact;
- *Agencies of the European Commission such as:* European Research Council Executive Agency (ERCEA), European Innovation Council Implementation Agency and Small and Medium Enterprises (EIC) are responsible for managing the Horizon Europe's area of activities and take major participation in the monitoring and evaluation process;
- *International organizations:* cooperation with international organizations such as the European Union Statistical Office (Eurostat) and the World Bank may involve providing additional data and comparative indicators to monitor and evaluate;
- *Ministries and agencies:* Ministries, agencies, and organizations responsible for research, science and innovation in EU member states play a role in providing data and information necessary for monitoring and evaluation when required.
- *Consulting experts:* independent consultants can be engaged to provide expertise and support in the design, implementation and analysis of monitoring and evaluation process activities;
- *Partners, scientists, and technology experts:* the contribution of partners, researchers and innovators involved in Horizon Europe projects is needed to collect relevant data and feedback for the monitoring and evaluation process;
- *Other stakeholders:* scientists, technology experts, stakeholders involved in Horizon Europe projects in providing relevant data for monitoring and evaluation processes.

The participation of organizations and individuals plays an important role, ensuring a comprehensive approach to information to monitor and evaluate the performance and impact of the Horizon Europe Program across many different aspects and levels.

1.4. Horizon Europe Program's monitoring and evaluation process

The Horizon Europe program monitoring and evaluation process includes 6 steps. These steps are designed to ensure effective assessment and measurement of the Program's impacts, outcomes, and objectives:

Step 1 - Determine monitoring index and comparison basis

This step includes identifying specific indicators that will be used to measure the Program's progress and impact against its goals. The comparison baseline is established to provide a reference point for comparing Program results over several time milestones. The Horizon Europe monitoring and evaluation framework is inherited from the Horizon 2020 monitoring and evaluation framework and has been developed to suit the new content and objectives. The monitoring and evaluation framework uses a combination of quantitative and qualitative methods, such as data analysis, interviews, and surveys. The analyzes conducted in these studies included a combination of evidence data.

Step 2 - Collect data and report

In this step, data is collected based on the identified indicators and basis of comparison.

Monitoring data can be used from data in periodic monitoring reports, bi-annual monitoring reports on the performance of European partners, global economic models, etc. They will include data from previous phase programs to analyze the long-term impact of EU research and innovation investments. In addition to secondary data, primary data is collected as a basis for analysis and evaluation.

The data is required to be provided in forms (proposal form, periodic report form, final report form) and is supplemented through the program's activity cycle (evaluation, funding, etc...). The Horizon Europe Program's reporting and information forms are continuously improved to simplify and facilitate data collection. Basically, when the data is collected, it will be checked and compared with several other data sources to verify and ensure that the data collected is complete and accurate, for example, patents, and publications data, etc. Horizon Europe's data can also be supplemented by publicly announced STI indicators of the EU, the World Bank, or other international organizations.

The collected data will then be reported and analyzed to evaluate the effectiveness and efficiency of the Program.

Step 3 - Analyze and make sense of the data

Collected data will be analyzed and meaningful to clarify the trends and results of the Program, compared with the goals set in each phase and each field of the Program's activities. This step helps identify successes, challenges, and areas for improvement of the Program going forward.

Step 4 - Reporting and communication

The results of data analysis are compiled into reports to communicate the Program's achievements and challenges. These reports are shared with

stakeholders, policymakers, and the public to ensure transparency and accountability. All data and indicators collected during the monitoring and evaluation process will inform the mid-term and final evaluation of the Horizon Europe Program. Each implementing agency of the European Commission publishes an annual performance report, which describes its achievements, the initiatives taken, and the financial and human resources used during the year. The final monitoring and evaluation report needs to provide reliable information about the level of achievement of the Program's general goals, specific goals, and future.

Step 5 - Learning and adaptation

This step includes using the insights gained from the monitoring and evaluation process to participate in the Program's decisions and adjustments. Lessons learned to enhance the effectiveness and efficiency of the Program.

Step 6 - Continuous feedback and improvement

Feedback from stakeholders and participants in the monitoring and evaluation process is collected to continuously improve the monitoring and evaluation framework. Based on the feedback received, monitoring indicators, data collection methods and reporting processes are adjusted and perfected to suit the practice.

The steps of the monitoring and evaluation process follow the above systematic approach to monitoring and evaluating the Horizon Europe Program, helping administrators make decisions to achieve the Program objectives and goals, and efficient use of resources.

2. Monitor and evaluate the implementation of science, technology, and innovation policies in Iran

2.1. Iran's science, technology, and innovation

Science and technology is considered the pillar that helps the Islamic nation of Iran have an important position in the Middle East. As a country subject to economic embargo, the Iranian Government advocates promoting S&T for economic development, defense, and security, and has prioritized investment in R&D, including from state budget sources and promote investment from the private sector. In 2015, investment in R&D in Iran accounted for 0.39% of GDP, by 2019, investment in R&D in Iran accounted for 0.79% of GDP[2].

The development of Iran's science and technology is demonstrated by the increase in publications related to science and technology. Iranian scientific publications increasingly appear in regional and international scientific journals. According to Web of Science's assessment, in 2019, Iran ranked 16th in the number of scientific articles published *(Tehran Times, 2020)*. The reason the number of scientific publications by Iranian authors has increased rapidly is due to the Government's incentive policies and sponsorship activities for S&T research activities. By 2021, Iran will have over 40 S&T parks operating

[2] Source: https://data.worldbank.org/topic/science-and-technology?locations=IR

throughout the territory; The number of high-tech, technology-intensive companies is increasing rapidly *(Tran Thuy Phuong, Tran Anh Duc, 2022)*. In the 2023 Global Innovation Index (GII), Iran ranks 62nd out of 132 ranked countries and is the middle-income economy that has made the most progress in innovation over the past decade.

Iran has established the Center for Technology and Innovation, which is one of the leading regional organizations in researching, promoting, and exporting Iran's innovation and high-tech products and services. Currently, the Iran Center for Technology and Innovation has facilities in China, Russia, Turkey, Kenya, and Syria. These centers provide the necessary infrastructure, foundation, and are a bridge between businesses, investors, research, production, startups, connections, and support in the field of technology and Innovation.

In recent years, Iran has been very successful in training high-quality human resources to serve the development of S&T. In 2023, the list of Best Rising Stars of Science in the World 2023 (a reputable electronic information portal for world scientists) world) by Research.com voted with the leader of the rankings being an Iranian scientist, second being a Vietnamese scientist. In addition, in this ranking of 1,000 scientists, Iran has 51 scientists ranked along with scientists in countries such as China (353), the United States (171), England (40), Australia (48), Germany (27), Singapore (26), South Korea (15), Vietnam (6) *(Tran Thuy Phuong, Tran Anh Duc, 2022).*

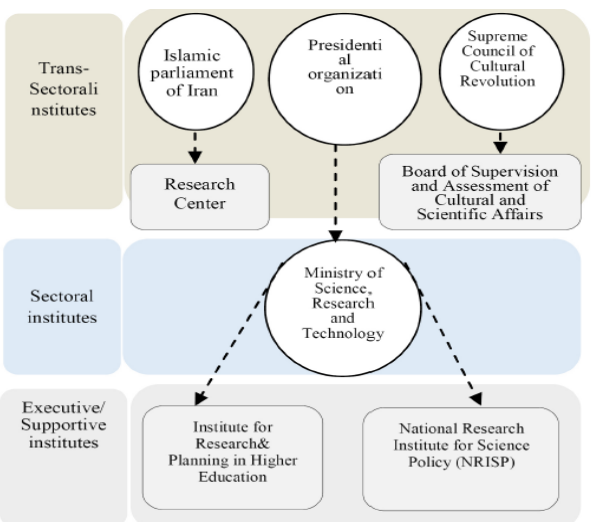
To reach the above achievements, Iran has built a system of policies such as: (i) increasing government investment in science and technology; (ii) training, attracting, using, and appreciating talented people; (iii) sponsoring start-up businesses; (iv) encouraging the spirit of entrepreneurship;... For these policies to be implemented effectively, Iranian agencies have participated in the process of monitoring and evaluating science, technology, and innovation policies.

2.2. Monitor and evaluate science, technology, and innovation policy in Iran

Iran attaches great importance to monitoring and evaluating science, technology, and innovation policies. Many supreme agencies participate in this work. According to research on monitoring and evaluating science, technology, and innovation policies in Iran *(Leila Namdarian, 2017)*, agencies participating in monitoring and evaluation include:

- *Islamic National Assembly of Iran*: The National Assembly implements several activities in monitoring and evaluating science, technology, and innovation, performing the supervisory role of the National Assembly in all fields;
- *Supreme Council of the Cultural Revolution*: In Iran, among the various councils formed in the post-Revolution period, the Supreme Council of the Cultural Revolution had the highest level of participation in terms of goals and basic mission of the Council. These activities are in the form of the Science, Technology and Innovation Monitoring and Evaluation Council in both macro and micro areas;

- *Ministries*: Among the ministries, the Ministry of Science, Research and Technology has the largest role in evaluating science, technology, and innovation. Other ministries, such as the Ministry of Health, the Ministry of Agriculture, and the Ministry of Information Technology and Communications, jointly participate in several activities. However, these activities are only short-term. Organizations under the Ministry of Science, Research and Technology that actively participate in the field of STI assessment include Institute for Higher Education Research and Planning, and National Institute for Science Policy Research.



Source: Leila Namdarian, 2017

Figure 1. System of agencies participating in monitoring and evaluating science, technology, and innovation in Iran

According to Leila Namdarian (2017), monitoring and evaluation of the STI system is not continuously carried out in Iran although this activity has been carried out by several organizations in different periods. On the other hand, through reviewing the goals and tasks of the organizations in the monitoring and evaluation system, it shows that there is no organization responsible for performing the task of collecting data related to science, technology, and innovation. It can be understood that Iran already has a national statistical agency but has not yet participated in the system of monitoring and evaluation agencies. Every year, Iran's Ministry of Science, Research and Technology reports on science, technology, and innovation activities, but the collection of annual statistical information is not considered important as a criterion for monitoring and evaluating science, technology, and innovation. Currently in Iran there is a lack of an organization with comprehensive responsibility related to monitoring and evaluating science, technology, and innovation policies. The existence of such an organization is essential to be able to deploy processes for monitoring and evaluating science, technology, and innovation regularly and effectively.

3. Monitor and evaluate the implementation of strategies and policies for developing science, technology, and innovation in South Africa

3.1. Policy goals for the development of science, technology, and innovation in South Africa

In recent years, South Africa's STI development policy has had many changes, focusing on promoting innovation and enhancing the impact of STI on national priorities, including economic growth and sustainable development; promote relationships between the Government, businesses, civil society organizations, research institutes and universities; At the same time, many aspects of STI were mentioned and how to establish a national innovation system management environment that is both comprehensive and open to create conditions for innovation. Science, Technology, and Innovation policies also focus on strengthening and transforming human resources in the system, expanding, transforming the research system, expanding the institutional framework, and increasing investment and funding efficiency.

The main goals of South Africa's new generation of STI policy recorded in the 2019 White Paper include:

- Strengthen focus on comprehensiveness and connectivity in the National Innovation System;
- Enhance the culture of innovation in society and government;
- Improve policy coherence and budget coordination between central government and state’s governments;
- Develop a more favorable environment for innovation;
- Develop local innovation system;
- Support innovation in society and at the grassroots;
- Expand the research system;
- Develop human capacity;
- Accelerate the implementation of the pan-African agenda;
- Increase investment in the National Innovation System.

For science, technology, and innovation policies to be effectively implemented in practice, the South African Government strengthens monitoring and evaluation activities, as mentioned in the 2019 Science and Technology White Paper. South Africa is lacking of a monitoring and evaluation framework for tracking the National Innovation System, and this is a major weakness and requires the Government's attention. Developing a monitoring and evaluation framework is an important step in enhancing the country's monitoring and evaluation capacity as well as achieving the goals set out in the 2019 Science and Technology White Paper. However, developing the monitoring and

evaluation framework is a complex and challenging process that requires consideration of the context as well as the current monitoring and evaluation capacity of relevant agencies. The monitoring and evaluation framework must be comprehensive and flexible enough to respond to future policy changes.

3.2. Organizations involved in monitoring and evaluating science, technology, and innovation policy

(i) National Advisory Council on Innovation

In South Africa, the unit that plays the most important role in the system of STI is the National Advisory Council on Innovation (NACI). This is an agency under the Ministry of Science and Innovation of South Africa with the main task of advising the Minister on national issues related to Science, Technology, and Innovation, thereby contributing to the achievement of national goals of South Africa. The Council is responsible for coordinating and developing the national system of innovation (NSI); promoting cooperation within the system; building, administering, and coordinating NSI; evaluating innovation policies; developing strategies to promote all aspects of technological innovation; identify priorities for research and development... The Council is the main unit responsible for developing the monitoring and evaluation framework for the 2019 Science and Technology White Paper.

(ii) Relevant ministries, branches and agencies

The National Advisory Council on Innovation is the organization in charge of monitoring and evaluating STI policies, and is responsible for coordinating with the governing body, the Ministry of Science and Innovation, and other ministries, branches and agencies such as Ministry of Planning, Monitoring and Evaluation, Ministry of National Planning and Finance, Department of Statistics, etc. to provide information and participate in the process of monitoring and evaluating STI policies.

During the monitoring and evaluation process, the National Advisory Council on Innovation will organize surveys to collect information and deploy information management systems to enhance analysis of effectiveness and efficiency of the science, technology, and innovation policy. Monitoring and evaluation results provide information to serve management levels and support strategic orientation for future development. Therefore, information and data provided from agencies and organizations need to be sufficiently reliable, objective, and reflect the true nature of the process of implementing science, technology, and innovation policies.

(iii) Organizations need to use the reporting results of the monitoring and evaluation framework

National regulatory agencies that oversee or mandate monitoring and evaluation reporting (the President, the Treasury, the National Assembly, and the Ministry

of Planning, Evaluation, and Monitoring); Key state agencies and national management agencies in the science and technology system: Ministry of Science and Innovation, National Research Foundation, Ministry of Trade and Industry, Ministry of College Education and Training, Association of College education quality assessment council and other agencies.

National agencies have collected data on monitoring and evaluation (e.g., Information Center on Science, Technology, and Innovation indicators).

Organizations operating in the field of science and technology (universities, government research laboratories, scientific councils, national research facilities, science, and innovation parks, etc.).

Other entities (non-governmental organizations, businesses...).

Thus, there are many organizations that need to use results from monitoring and evaluating science, technology, and innovation policy, showing the very important role of this activity in South Africa.

3.3. Process for monitoring and evaluating science, technology, and innovation policies

The process of monitoring and evaluating STI policy in South Africa involves regular collection and analysis of data on key indicators related to science, technology, and innovation. This process is designed to track progress towards the goals and targets set out in the 2019 S&T White Paper and to inform the evidence-based data for decision-making process in the areas of program design and science, technology, and innovation policy.

The monitoring and evaluation process includes 5 steps:

Step 1 - Determine evaluation criteria

The National Advisory Council on Innovation, in consultation with relevant parties, determines relevant criteria to monitor the progress in implementing STI policies. The criteria include different aspects of Science, Technology, and Innovation such as: investment in research and development, innovation performance and human resource development, patents, commercial exploitation, etc. To arrive at the evidence-based evaluation, the evaluation process should address specific systems, policies, and strategic goals, such as productivity, efficiency, inclusiveness, diversity, relevance, and sustainability,... These indicators can be quantitative (based on measurements and statistics) or qualitative (extracting information from sources such as interviews or case studies).

Step 2 - Data collection

The National Advisory Council on Innovation collects data on identified indicators from various sources such as surveys, data extraction from the Department of Statistics, from reports and research works. The Council also works closely with government agencies and other stakeholders to ensure the availability, timeliness, and reliability of data.

Step 3 - Analyze data

Collected data is analyzed to identify trends, patterns, and performance in the field of Science, Technology, and Innovation. The National Advisory Council on Innovation uses various statistical and analytical methods to analyze data and develop reports on the results of monitoring and evaluating science, technology, and innovation.

Step 4 - Report

The National Advisory Council on Innovation periodically reports on the results of monitoring and evaluating Science, Technology, and Innovation, and disseminating it to relevant parties and the public. The reports provide information on progress towards the goals and targets set out in the 2019 STI White Paper and provide information to support evidence-based decisions in STI policy and the program design.

Step 5 - Feedback and adjustments

The monitoring process provides feedback on the effectiveness of STI policies and strategies, thereby helps adjust based on information collected from monitoring and data analysis.

4. Monitor and evaluate strategies and policies in some other countries

4.1. Russia

The Science and Technology Development Strategy for the period 2017-2025 of the Russian Federation was approved on December 1st, 20163, including regulations on monitoring the implementation of the Strategy. Accordingly, to monitor the implementation of the Strategy, the Government of the Russian Federation together with the Presidium of the Council of the President of the Russian Federation on science and education have developed indicators to evaluate the implementation of the Strategy, to monitor the level of achievement in implementing the Strategy's objectives, including:

- The influence of science and technology on the socio-economic development of the Russian Federation, including the transition to a model with many great challenges;
- Status and effectiveness of the field of Science, Technology, and Innovation;
- Quality of State regulations and support services for science, technology and innovation activities.

The monitoring of the implementation of the Strategy for the Development of Science and Technology of the Russian Federation is carried out by the Government of the Russian Federation, while analysis of the implementation of

[3] Strategy for science and technology development of the Russian Federation for the period 2017-2025, <https://tadviser.com/index.php/Article:Strategy_for_Scientific_and_Technological_Development_of_the_Russian_Federation>

the plan is carried out by the Presidium of the Council of the President of the Russian Federation on Science and Education. The results of monitoring the implementation of the Science and Technology Development Strategy and the implementation of the plan are reflected in the professional analysis report of the Government of the Russian Federation and the Presidium of the Council of the President of the Russian Federation, submitted to the President of the Russian Federation at least every three years. This is also the basis for proposing adjustments to the Strategy in case of necessity.

4.2. Mexico

Mexico monitors and evaluates the implementation of the 2015-2030 Strategic Plan, a document on the vision and sustainable development roadmap for the Mexican state of Nuevo Leon. The Plan is designed to set a direction for socio-economic and environmental progress over a period of 15 years, from 2015 to 2030. The Strategic Plan includes many development goals and important directions with many programs and projects to promote inclusive development, improve infrastructure, encourage innovation and technology development, improve education, protect the environment and natural resources. The Strategic Plan aims to address challenges and take advantage of opportunities to ensure a better quality of life for the people of the state of Nuevo Leon.

The core role of monitoring and evaluating the implementation of the 2015-2030 Strategic Plan in Mexico is "using evidence to achieve sustainable development", specifically as follows:

- *Progress tracking:* helps track changes, progress, and the level of achievement of the goals identified in the Strategic Plan. This helps determine whether targets are being achieved on time and whether adjustments are needed to ensure overall progress of the Strategic Plan towards its objectives;
- *Evaluate effectiveness and efficiency:* measuring the effectiveness and efficiency of programs and projects within the framework of the Strategic Plan
- *Social and economic impact assessment:* monitoring and evaluation to see the impact of the Strategic Plan's programs and projects on society and the economy. This helps determine whether adjustments to the Strategic Plan are needed to maximize positive impacts and minimize negative impacts;
- *Providing information:* providing information on the progress, effectiveness, and impact of the Strategic Plan on the economic and social development of the State of Nuevo Leon.

Monitoring and evaluation activities need to be carried out continuously, regularly, and systematically to provide accurate and necessary information to adjust and improve the 2015-2030 Strategic Plan in Mexico.

4.3. Korea

Korea conducts public policy monitoring and evaluation in many fields and activities, including:

- Institutional evaluation, including evaluation of major policy measures, policy implementation capacity and survey of public satisfaction with government services;
- Evaluate major programs and projects, including several key projects, selected according to the importance of the industry, sectors, and compatibility with the Government's policies;
- Evaluate the policy implementation capacity, including self-evaluation of management ministries, as well as evaluation of institutional capacity to reform, innovate and improve services;
- Public satisfaction survey with key policy measures and administrative services, probe public satisfaction with key government policies, programs, and services.

Although Korea has made a lot of progresses in monitoring and evaluation, many challenges remain. Korea needs to continue to strengthen cooperation and coordination between monitoring and evaluation agencies, increase trained human resources and improve the effectiveness of ex-post monitoring and evaluation recommendations.

5. Some findings from research on international experience and lessons for Vietnam in conducting monitoring and evaluation of science, technology and innovation strategies and policies

Around the world, countries want to maintain a results-based system of monitoring and evaluating strategies and policies, that can help better inform and guide the Government in implementing necessary reforms in all monitored and evaluated areas. To establish and maintain a monitoring and evaluation system, first, the Government's attention and the commitment of relevant parties are needed. Next, it is necessary to have a good information and data system, ensuring appropriate both quality and quantity. In addition, human resources need to be trained in methods of collecting, monitoring, evaluating, and analyzing data to maintain this system, and good connection and cooperation between agencies and organizations to carry out monitoring and evaluation is also needed. Below are some observations from research and experience of countries that Vietnam can refer to in monitoring and evaluating STI strategies and policies.

***Firstly**, about the need to regularly monitor and evaluate the implementation of STI strategies and policies.*

Countries around the world have made many efforts to maintain monitoring and evaluation of STI strategies and policies. Monitoring and evaluation are considered indispensable activities to improve the implementation of STI strategies and policies. Promote monitoring and evaluation of STI strategies and policies as an activity that creates added value for agencies, organizations, and countries instead of being purely considered and implemented as a simple administrative task. Monitoring and evaluation can be understood as two types

of activities that are closely linked, supporting, and complementing each other, however in many cases it is impossible to separate monitoring and evaluation.

***Second**, on the role of monitoring and evaluating the implementation of STI strategies and policies.*

Monitor and evaluate the implementation of STI strategies and policies to track the progress of strategy and policy implementation; evaluate effectiveness and efficiency; evaluate socio-economic impacts; provide information to agencies managing STI strategies and policies, specifically as follows:

- Monitor the progress of implementing strategies and policies: to determine whether the actual implementation progress of the strategies and policies meets the identified requirements or not;
- Evaluate the effectiveness and efficiency of strategies and policies: to measure the effectiveness and efficiency of programs, projects, and implementation measures within the framework of the Strategy; Determine the level of achievement of set goals according to timelines. This helps determine whether strategies and policies are achieving their goals, whether they are causing unwanted impacts, and whether the implementation strategy needs to be adjusted to meet the overall goals of the strategy, and policy;
- Monitor and evaluate social and economic impacts: to evaluate the impact of strategies and policies on socio-economic development. This helps determine whether adjustments need to be made to maximize positive impacts and minimize negative impacts;
- Develop reports and related information: Reports provide information about the process of implementing strategies and policies; the results achieved during the implementation cycle; effectiveness and impact of strategies and policies. This information helps managers behave appropriately.

***Third**, about organizations participating in monitoring and evaluating the implementation of STI strategies and policies.*

To implement monitoring and evaluation of STI strategies and policies, several national agencies and organizations on STI have participated in the monitoring and evaluation process. In general, the governing organization is the Ministry of Science, Technology, and Innovation; Participating organizations are ministries and branches related to the field of STI, statistical organizations and other relevant organizations and individuals. These organizations need to have active and close association and coordination with each other in collecting, analyzing, reporting data and evaluating the appropriateness, effectiveness and efficiency of strategy, and policy implementation.

***Fourth**, on the framework for monitoring and evaluating STI strategies and policies.*

To monitor and evaluate STI strategies and policies to achieve good results, it is necessary to build a monitoring and evaluation framework with a process of 5 key steps:

(1) Determine monitoring and evaluation criteria: This is an important step in determining appropriate indicators to use to measure operational progress and the degree to which it meets the requirements of STI strategies and policies implementation in practice;

(2) Data collection: Collected data needs to be reliable and objective through scientific methods. Data can include secondary data and primary data;

(3) Data analysis: This is a step that requires experienced experts in the field of STI to evaluate the results of implementing STI strategies and policies, new trends, impacts and the level of achieving the set goals of strategies and policies;

(4) Report to competent authorities: Report to competent authorities on the results of monitoring and evaluating STI strategies and policies;

(5) Feedback and adjustment of strategies and policies: Competent agencies propose plans to be implemented following the process of monitoring and evaluating STI strategies and policies.

***Fifth**, on the principle of monitoring and evaluating STI strategies and policies.*

The process of monitoring and evaluating strategies and policies needs to be carried out to ensure transparency and objectivity, reflecting the reality of the process of implementing STI strategies and policies.

Finally, building a truly effective monitoring and evaluation system requires time, resources, and a stable environment to operate and needs to be gradually improved during implementation.

With comments drawn from experience in monitoring and evaluating STI strategies and policies in the above countries, Vietnam can be used as a reference in building a monitoring and evaluation system for strategies, policies in general and strategies and policies for the development of science, technology, and innovation, to improve the efficiency and effectiveness of strategies and policies to meet the set goals./.

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