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Article

Complete policies and laws on science and technology to meet the requirements of sustainable development in Vietnam

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Abstract: Science and technology play an extremely important part in today's world. They are the key for countries to reach a certain level of economic and social development. Thus, in order to catch up with the common development of mankind, countries have issued their own policies and laws on science and technology activities. National science and technology policies aim to enhance social welfare, foster sustainable development, and advance global scientific and technological progress. Vietnam is considered as one of the countries attaching great importance to science and technology. Therefore, even in the law with the highest legal value—the Constitution has solemnly recognized the position and role of science and technology as the leading national policy, playing a major role in the cause of the country's socio-economic development. However, in the face of the requirements of sustainable development and the desire for the country's prosperity and strength, policies and laws on science and technology in particular and policies and laws in general of Vietnam must be perfected and renewed continuously, especially in the context of globalization and sustainable development requirements, modern nation as it is today. Therefore, the article focuses on clarifying the situation of adjusting policies and laws on science and technology in Vietnam during the past, thereby proposing new complete solutions in the coming time. This is the basis for policy makers to refer to in the process of developing policies and laws on science and technology in Vietnam.

Keywords: science and technology; policies and laws on science and technology; sustainable development

1. Introduction

Presently, the purpose of establishing policies and laws on science and technology (S&T) in different countries is not the same. Accordingly, in Japan, as a country with few natural resources and facing a rapidly aging population, the only way Japan can cope with increasingly fierce international competition is to show its creative capacity to explore new fields of science and technology. It can be mentioned that the birth of the world's first wireless telephone in the Minh Tri era from 1868 to 1912; or the invention of lithium-ion batteries led to the development of a wide range of electronic devices, especially in the field of audio; or the production and manufacture of robots in the 1980s; vending machines, pocket computers (Japan National Tourism Organization, 2024), etc. It is the strong development of science and technology in Japan that Basic Act on Science and Technology in 1995 was enacted to improve the level of science and technology in Japan. As a result, the Basic Act on Science and Technology in 1995 was comprehensively and systematically provide science and technology policies contributing to Japan's socio-economic development,

improving national welfare, and playing a part in global science and technology progress as well as the continuous development of mankind (National Science Foundation, 1996). With this approach, Japan soon joined and became an advanced industrialized country in the world (National Science Foundation, 1996). Compared to Japan, South Korea is considered a global power in science and technology, one of the most advanced digital economies in the world and a leading country in some industries, involving electronics, automobiles, steel and shipbuilding (Organisation for Economic Co-operation and Development, 2021). To achieve such success, South Korea emphasizes the importance of strengthening basic scientific research activities in laws to create further breakthroughs in S&T. Concurrently, it calls for building a broader and more innovative scientific foundation to possibly compete in the international market. Thus, with regard to legislation, laws related to science and technology of Japan and Korea apppear in order to promote and develop the country's talented workforce on the one hand, and on the other hand to develop the economy, to improve people's lives as well as to improve people's understanding of science and technology. This is the common aim of policies and laws on science and technology of countries in the world.

In Vietnam, the area of Science and Technology was interested very early when this field was recognized for its position and role in Party documents through the periods. Particularly, the field of science and technology was institutionalized by Law on Science and Technology in 2013. As the original law in the field of Science and Technology, the Law on Science and Technology 2013 has contributed to timely and relatively comprehensive institutionalization of the Party's guidelines and the State's policies on science and technology development in service of industrialization and modernization in the conditions of socialist-oriented market economy and international integration in Vietnam.

2. Literature review

Currently, S&T development includes all research and application activities. In which, the results of basic research and applied research are used, through experimental implementation and trial production in order to perfect existing technology and create new technologies to put into production and human life with higher productivity and efficiency. Because of this, all countries in the world value and invest in S&T development. In Vietnam, the development of science and technology has a strong impact on sectors and fields of social life, greatly contributing to promoting Vietnam's outstanding economic growth. Specifically, in the field of health, thanks to the application of technology in the medical field over the past time in Vietnam, many outstanding results have been achieved. Now, there is a hospital information system software in almost all hospitals, initially deploying image transmission and storage software (PACS); 99.5% of hospitals have connected and linked the data of health insurance examination and treatment with health insurance assessment and payment agencies, serving electronic health insurance examination and treatment. The Ministry of Health has successfully and effectively implemented online public services connecting the National Single Window Portal, implementing the National Single Window and ASEAN Single Window. The ministry's electronic

document management and administration system is interconnected with the Government Office, more than 20 ministries, branches and People's Committees of provinces and cities; publicizes the results of administrative procedure settlement on the Government Portal. The preventive medicine management information system deploys immunization software expanded across the country. There have been more than 6.2 million immunized subjects managed (Ninh Binh Provincial Department of Health, 2023). The above successes are thanks to the correct policies and guidelines of the Communist Party of Vietnam on the development of science and technology, and the State's timely institutionalization of those policies and guidelines. Accordingly, the whole time, the Party and the State have issued lots of documents, which set out many tasks and solutions focusing on promoting hierarchy and decentralization, and simplifying administrative procedures in state management; simplify processes and procedures, promoting digital transformation in state management of science and technology; improving transparency, ethics and integrity in science and technology activities; attracting investment from society for the development of science and technology; improving efficiency and autonomy for public non-business organizations with respect to science and technology; developing intellectuals needs to be fully institutionalized into the content of Law on Science and Technology. The following documents can be mentioned: (1) The 10-year socio-economic development strategy for 2021–2030 was adopted at the Party's 13th National Congress. In detail, the development perspective clearly states "Rapid and sustainable development relies mainly on science and technology, innovation and digital transformation". Simultaneously, it sets out important directions, tasks and solutions for the State to concretize: "Concentrate on perfecting institutions, policies and laws in line with market mechanisms and international practices to develop Vietnamese science; firmly develop science and technology and innovate, taking enterprises as the center; promote developing new business models, digital economy and digital society. There are economic and financial mechanisms and policies so as to encourage enterprises to take part in technological research, development and innovation. Allow the implementation of new policy testing mechanisms, promoting the deployment and the application of new technologies, innovations and new business models." (2) Resolution No. 23-NQ/TW dated 22 March 2018 of the Politburo on orientations for formulating national industrial development policies to 2030, with a vision to 2045, has determined: "Have policies strong enough to support and encourage organizations, individuals, research institutes, universities and enterprises to invest in research, development, technology transfer and S&T advance application to production and business"; "Review and amend regulations to create favorable conditions for enterprises to form funds for research, development and application of science and technology large enough to meet the requirements of technological innovation. Apply tax policies, financial support, and access to appropriate resources to encourage research, innovation, and technological modernization." (3) Resolution No. 52-NQ/TW dated 27 September 2019 of the Politburo on some guidelines and policies to actively participate in the Fourth Industrial Revolution set out the task: "Conplete the law, first of all, the law on enterprises and creative start-ups; Complete financial policies to encourage and mobilize all social resources to invest in scientific research, technology development and application, and innovation activities." (4) Resolution No. 29-NQ/TW dated 17

November 2022 of the Sixth Conference of the 13th Party Central Committee on continuing to promote industrialization and modernization of the country until 2030, with a vision to 2045, set out tasks and solutions: "Determine that the core content of the country's industrialization and modernization in the period of 2021–2030 is to promote the strong application of science and technology, innovation, especially the achievements of the Fourth Industrial Revolution, to create breakthroughs in productivity, quality, efficiency and competitiveness of industries, fields and the whole economy; Implement comprehensive, substantive, effective and sustainable digital transformation". (5) Resolution No. 45-NQ/TW dated 24 November 2023 of the Eighth Conference of the 13th Party Central Committee on continuing building and promoting the intellectuals' role to meet the requirements of rapid and sustainable national development in the new stage set out the task: "Perfect specific mechanisms and policies suitable to the activities of intellectuals; innovate the management of science and technology; Focus on supporting and promoting innovation, acquisition and dissemination of advanced knowledge. Promote hierarchy and decentralization in the direction of increasing autonomy and self-responsibility of science and technology organizations along with higher education institutions in appointing leaders and scientific titles; Study and amend the working age in accordance with the activities of intellectuals. Innovate and improve the efficiency of evaluation and recognition of scientific titles; Review and complete the system of state awards, sectoral and field awards and other honoring policies for intellectuals." (6) Conclusion No. 69-KL/TW dated 11 January 2024 of the Politburo to continue the implementation of Resolution No. 20-NQ/TW dated 1 November 2012 of the 11th Party Central Committee on science and technology development for industrialization and modernization in the context of a socialist-oriented market economy and international integration has identified six key tasks, including: "Continue to improve policies and laws on science, technology and innovation in accordance with market mechanisms and international practices and standards, creating synchronization, unity and efficiency in the implementation organization. Attach importance to policies on finance, investment, bidding, management and use of public assets, science and technology transfer and application, digital technology development, high technology, intellectual property protection; socialization policy. At the same time, research and develop specific mechanisms, policies, outstanding policies, mechanisms for testing new policies and risks so as to promote the development, application and transfer of scientific and technological fields with foundational, prioritized, spearhead, high technology, core technology, source technology, etc., new technologies and digital transformation; Promote the application of science and technology advances in research and development of products with competitive advantages, high value, and environmental friendliness, effective participation in production chains, supply chains and global value chains". Therefore, with the above major policies of the Communist Party of Vietnam on science and technology development, the Party sees and affirms the great role of science and technology. This is the field that has become the most important input factor of the modern production force, the key to determining the speed and growth model, improving Vietnamese economy's productivity, quality, efficiency and competitiveness. Concurrently, this is a key field, a great source of motivation to bring the country into a new stage of development—faster and more sustainable

development (Phai and Cuong, 2021).

Beside the Party's major policies, the State has realized the Party's views, policies and guidelines on science and technology in important legal documents, programs and strategies. This is an important legal basis for organizations and individuals to participate in scientific research, experimental research and implementation, technology development and application, science and technology services, promoting initiatives and other creative activities for science and technology development. At the same time, this is the legal basis for central and local state agencies to promulgate science, technology and innovation strategies for the development of sectors and localities in the new period. It can be mentioned that the 2023 Constitution affirms in Article 62: "The development of science and technology is the top national policy, playing a central role in the country's socio-economic development. The State prioritizes investment and stimulates individuals and organizations to invest in research, development, transfer, and science and technology achievements' effective application; ensures the right to do research on science and technology; protects intellectual property rights. The State creates conditions for every person to join and benefit from science and technology activities." Next, Law on Science and Technology 2013 was born as the original law, which has contributed to timely institutionalization of the policies and guidelines of the Party and the Constitution of the State in the development of science and technology to serve the goal of rapid and sustainable national development in accordance with domestic conditions and international context. Moreover, there are documents such as: Decision 36/QD-TTg dated 11 January 2021 of the Prime Minister on the Master Plan to improve productivity based on science, technology and innovation in the period of 2021–2030; Decision No. 569/QD-TTg dated 11 May 2022 of the Prime Minister on the Strategy for the development of science and technology as well as innovation to 2030; Decision 899/QD-TTg dated 31 July 2023 of the Prime Minister on the National Strategy on attracting and utilizing talents to 2030, with a vision to 2050.

3. Methods

The methodology used in this study is a qualitative research approach to regulations in policies and laws on science and technology in Vietnam. These are the major guidelines and policies of the Communist Party of Vietnam in the documents of the Congresses; regulations in policies and laws of the State on the development of science and technology. Additionally, the study uses results from research works and data reports from relevant state agencies, departments and branches on implementing policies and laws on science and technology in Vietnam in recent times. Besides, the study uses the results of in-depth interview methods from civil servants working in state management agencies and scientists when referring to the inadequacies of policies and laws on science and technology in Vietnam in recent times. From these main research methods, it can be seen that the issue of formulating and implementing policies and laws on science and technology has had certain successes and limitations, and thereby made recommendations for completion in Vietnam in the coming time.

4. Results and discussion

4.1. Regarding success of policies and laws on science and technology in Vietnam

Vietnam's policies and laws on science and technology have received special attention since 2000s with the introduction of Law on Science and Technology, which now is Law on Science and Technology in 2013. Its birth marks a progress in awareness and thinking about the development and application of science and technology in life. Thus, the success of policies and laws on science and technology in Vietnam is reflected in the following main contents:

Firstly, policies and laws on science and technology, especially Law on Science and Technology in 2013, have played an important part in creating a basic and important legal corridor for continuing strong innovation, synchronous organizations, management mechanisms and mechanism of science and technology activities; promoting the development of the science and technology market. Accordingly, Law on Science and Technology in 2013 has escaped the shadow of planning in science and technology management compared to Law on Science and Technology in 2000, when it has included three contents that are considered to be breakthroughs in the law: innovation of investment methods for science and technology, innovation of financial mechanisms, and development of policies on employing and honoring science and technology officials (Ministry of Science and Technology, 2024). The reason for the above successes is that there has been a great change in the perception of the position and role of science and technology in the fields of social life and for the development of the country from the Party, the State and society. Besides, the development of policies and laws on science and technology has changed in the way of implementation when the gaps between policies and practical requirements have been resolved in order to provide opportunities for scientists to do more science and contribute more to society.

Secondly, the birth of policies and laws on science and technology has ensured conformity and compatibility with international treaties that Vietnam has committed to or participated in, and improves Vietnam's international position in science and technology. According to a report by the Ministry of Science and Technology, Vietnam is currently a member of nearly 100 international organizations in science and technology; has relations of science and technology cooperation with more than 90 countries, territories and international organizations; more than 80 international treaties and agreements on science and technology cooperation at the government and ministerial levels have been signed and implemented (Department of Science and Technology of Phu Yen Province, 2023).

Thirdly, policies and laws on science and technology have created a synchronous mechanism in training, attracting and employing human resources and science and technology talents, practicing democracy, respecting and promoting freedom of thought in research and creative activities of intellectuals for the country's development. Accordingly, so as to train, attract and employ human resources and science and technology talents, there are many legal documents issued such as Decree No. 40/2014/ND-CP dated 12 May 2014 of the Government regulating the employing

and honoring of individuals in science and technology activities; Decree No. 87/2014/ND-CP dated 22 September 2014 of the Government regulating the attraction of individuals in science and technology activities who are Vietnamese abroad and foreign experts taking part in science and technology activities in Vietnam. These are policies contributing to encouraging, supporting and creating conditions for scientists in general, leading scientists, talented young scientists, overseas Vietnamese scientists and foreign experts to participate in science and technology activities in Vietnam. For instance, to support research and development activities in the field of microchips, the Ministry of Science and Technology has approved several science and technology tasks in national science and technology programs. Through research and trial production tasks, Vietnam's research team and technical staff have gradually improved their capacity and mastered some technologies in the IC industry. At the same time, an ecosystem of research and development in the field of integrated ICs has been gradually formed.

4.2. Regarding major limitations of the law on science and technology in Vietnam

In 2024, one of the outstanding legislative activities related to the area of science and technology is the National Assembly's policy and inclusion in the Session Resolution with the plan to amend Law on Science and Technology in 2013. In which, the National Assembly assigned the Government, directly the Ministry of Science and Technology, to review and complete the Impact Assessment Report and develop an outline for the development of the Law amending and supplementing some articles of Law on Science and Technology in 2013. With a determination to comprehensively amend Law on Science and Technology to ensure the feasibility when applied to life, to become an effective tool and an important legal corridor to strongly promote science and technology together with innovation in the coming time in Vietnam. Based on the Impact Assessment Report of Law on Science and Technology in March 2024 and the Proposal to develop the Law amending and supplementing some articles of Law on Science and Technology in 2013 (according to Official Dispatch No. 1026/BKHCN-PC dated 27 March, 2024) issued by the Ministry of Science and Technology, it shows that there have been many new ideas and new contents that are "transformative". Specially, it is the identification of major policy groups (15 major policies), policy groups referring to objectives, contents and solutions to ensure implementation. Nevertheless, there are some policy groups that have not highlighted the need for legal adjustment in order that the Law on Science and Technology really becomes the legal basis to promote national development resources. Specifically:

Firstly, policies to attract, incentivize and employ scientists in the field of science and technology have not been as expected. Individual scientists in the area of science and technology in particular and S&T human resources in general are factors contributing to creating the potential for S&T development of a country. As a result, in addition to Law on Science and Technology in 2013, the Government issues separate documents regulating the use and appreciation of individuals engaged in science and technology activities (Prime Minister, 2024) and documents on attracting overseas Vietnamese and foreign experts to join science and technology activities in

Vietnam (Government of Vietnam, 2014). This is an important policy and law to create, use and promote intellectuals and scientists role to meet the requirements of rapid and sustainable national development in the new period. For domestic scientists, the law focuses on incentives and remuneration for three target groups: leading scientists, scientists assigned important national tasks by the state and talented young scientists. These are considered to be subjects whose products really contribute to the development of science and technology in particular and the economic and social development of the country in general. For each target group, the state stipulates different preferential and meritocratic policies. Specifically: (1) Regarding preferential policies, individuals with achievements in science and technology activities, meeting the requirements of job positions will be considered for special recruitment and appointed to scientific and technological titles, classified into salary grades suitable to training levels as prescribed (Article 5, Decree No. 40/2014/ND-CP); To be exceptionally appointed to scientific titles and higher technology titles without passing promotion examinations, regardless of the year of work (Article 6, Decree No. 40/2014/ND-CP); Receive an outstanding salary increase (Article 7, Decree No. 40/2014/ND-CP); To be provided with working conditions (Article 8, Decree No. 40/2014/ND-CP); To extend the working time when reaching full retirement age (Article 9, Decree No. 40/2014/ND-CP); Incentives for individuals involved in science and technology activities with the titles of professors or associates professor (Article 9, Decree No. 40/2014/ND-CP). (2) Regarding meritocratic policies, for leading scientists, the preferential salary regime is higher than the general level (one more time basic salary), besides, the State annually assigns a budget amount for them to spend autonomously according to the mechanism of funds performing their functions. Here there is a principle that scientists have full rights to use money from the state budget to take care of common affairs. For instance, to hire graduate students to work, to invite and pay high salaries to good domestic scientists, to invite foreign scientists to Vietnam for short periods of time for research cooperation, to purchase equipment and professional documents necessary for research activities, proactive participation in international conferences, or to pay taxes and fees related to intellectual property, international publication, to build strong research groups, etc., that is, all espenses related to research. And at the end of the year, scientists are responsible for settlements as normal S&T tasks in the form of allocated expenditures, with full documents and contracts. These are preferential and meritocratic policies designed in accordance with the context and conditions of Vietnam. However, in reality, the policy on wages and incomes for scientific human resources in general and scientists in particular is not really commensurate with the contributions of this force to science, technology and social economic development. Acknowledging difficulties in implementing salary policies for scientists, Ms. Nguyen Thi Ngoc Diep, Director General of Legal Department, Ministry of Science and Technology—representing state management agency in charge of science and technology said: “Leading scientists, those who lead national science and technology tasks and talented young scientists are proposed funding from the state budget to implement strong research tasks and groups. However, the implementation of the policy encounters many obstacles because the state budget is limited, and many regulations are not synchronized with other laws, etc.” (Hanh, 2023). Or according to the opinion of the

scientist Prof. Dr. Pham Hung Viet, Director of the Key Laboratory of Analytical Technology for Environmental Testing and Food Safety at the University of Natural Sciences (Hanoi National University), said: "Financial resource constraints are the top reason why young scientists cannot focus on research. A lot of people are competent but have to leave the lab to find a more stable paying job" (Thoi Nay, 2023). This is an ongoing reality when scientists do not have enough income from scientific research activities to ensure a living. If low wages are not enough to support their family and their children's education, it forces them to do other jobs to earn extra income, which is also the cause of negative problems in society. Meanwhile, the propotion of science and technology human resources in Vietnam accounts for a large number. As of 2021, the whole country has 187,298 people engaged in research and development activities, with a high concentration in higher education institutions, accounting for 51.99%, followed by research and development institutions accounting for 17.85% (Ministry of Science and Technology, 2024). Or in Ho Chi Minh City, as of 31 December 2022, there were 7888 people working in science and technology organizations under the management of Ho Chi Minh City (according to data reported by 228/382 science and technology organizations). In which, female human resources account for 45%. There is a large gender gap at the doctoral level. The remaining levels have little difference (CESTI, 2023) (See also **Figures 1–3**).

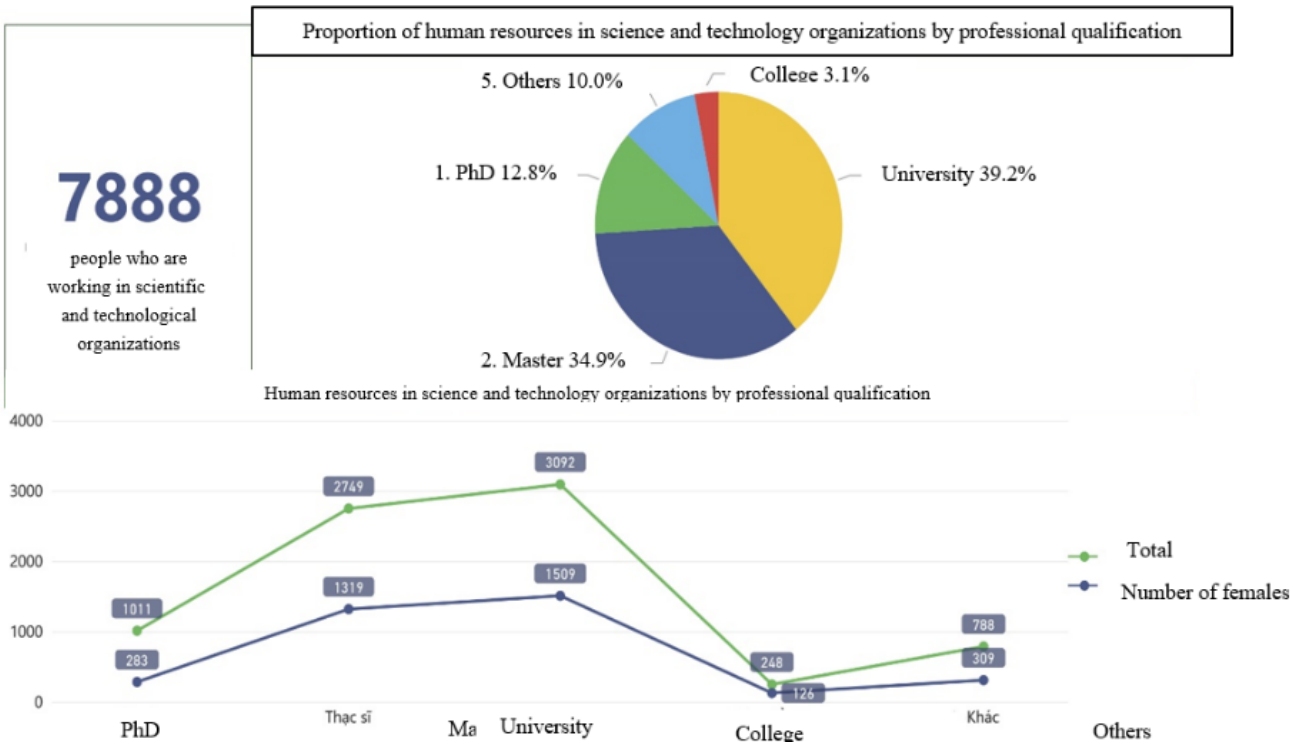

Figure 1. Proportion of human resources in science and technology organizations by professional qualification.

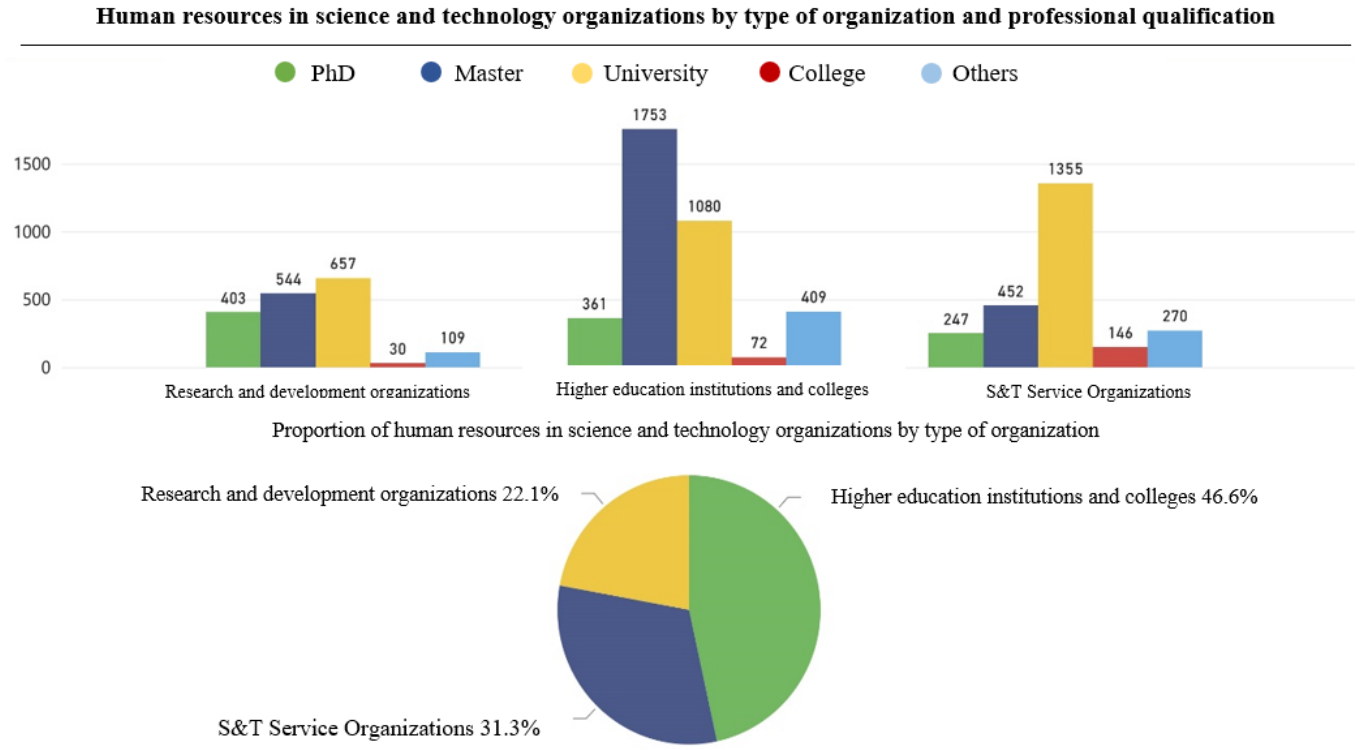

Figure 2. Proportion of human resources in science and technology organizations by type of organization and professional qualification.

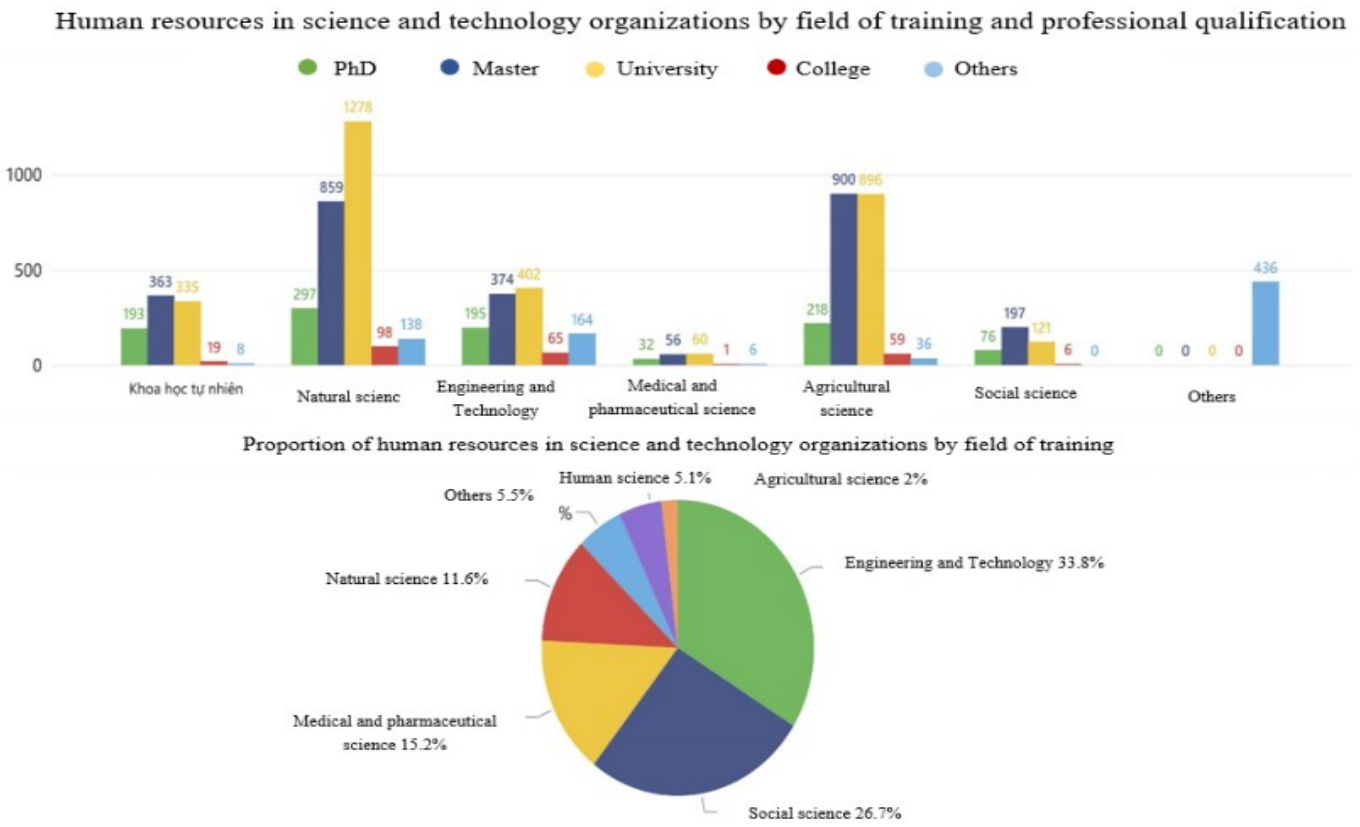

Figure 3. Proportion of human resources in science and technology organizations by field of training and professional qualification.

Secondly, there is a lack of some important policies on science and technology development and innovation. Currently, one of the top priority solutions set out in the Strategy for Science and Technology Development and Innovation to 2030 is to amend and perfect the system of policies and laws on science and technology, and related laws to suit the requirements set forth in the new situation. This is an important task of the State in managing science and technology activities. According to Article 6 of Law on Science and Technology in 2013, the State formulates and implements basic policies to ensure the development of science and technology as the top national policy such as: *"1) Prioritize and concentrate every national resource for the development of science and technology; Synchronously apply mechanisms and incentives so as to promote the science and technology's key role and driving force in socio-economic development, guaranteeing national defense and security, protecting the environment and improving people's quality of life; 2) Synchronously develop the fields of social sciences and humanities, natural and technical sciences along with technologies; associate the task of the development of science and technology with the task of socio-economic development and ensure security and national defense; create a premise for the knowledge economy's formation and development; 3) Promote researching and applying the achievements of advanced and modern science and technology, research into mastering and creating new technologies so as to innovate and raise the products' technological levels and competitiveness; 4) Focus on investment in construction of material and technical foundations, paying attention to national priority and key science and technology; Apply special incentive policies and mechanisms with an aim to developing, training, attracting and effectively using scientific and technological human resources; 5) Facilitate the development of science and technology markets; 6) Support and create favorable conditions for enterprises to invest in science and technology activities, innovate and raise technological levels; 7) Support and create conditions for scientific and technical associations along with socio-political, social and socio-professional organizations participating in consultancy, criticism, social assessment as well as science and technology activities; 8) Proactively and actively integrate into science and technology internationally; enhance the national position in science and technology in the region and in the world."* These are basic policies, similar to policies on science and technology of nations around the world. However, in the current new context when Vietnam's economy is strongly transforming to a socialist-oriented market mechanism. The need for economic and social development with a growth model based on high-quality human resources and motivation factors of science and innovation is increasingly clear. Besides, the impacts of Vietnam's deep and comprehensive integration in a strong and sudden development world, especially in science, technology and innovation, require legal corridors and policy mechanisms to be adjusted to suit the reality. Furthermore, in the face of new waves of intense development, governments must always be ready to adjust policies and adapt; and generally recognized practice in the world shows that the public sector and public governance policies on S&T of governments are always behind the development speed of S&T (Ministry of Science and Technology, 2024). In light of the above requirements, it is necessary to study and supplement new adjustment policies accordingly in the coming time in Vietnam.

Thirdly, the state budget investment in science, technology and innovation is not

really adequate. Presently, the regulation of the state budget allocation rate for scientific research activities is at least 2%, which is very modest, inadequate and has not reached the necessary and sufficient threshold. According to the State Audit report, the level of expenditure from the state budget to invest in science and technology in Vietnam only accounts for more than 0.6% of GDP, while in the US in 2017 it was 2.83%, China was 1.96%, Singapore was 2.6%, Malaysia was 1.25% (Thuy Van, 2021), etc. Besides, among sources from the state budget, most of them are invested in recurrent expenditures on salaries, apparatus, and regular tasks, while the allocation for implementing tasks of scientific research as well as technological development is very low. For example, in the period of 2016–2021, the total budget allocation was VND 3772 billion but only VND 519 billion was allocated to carry out science research and technology development tasks (Toan, 2023). Meanwhile, the Party and the State identify that along with science and technology, the top national policies are education and training. Consequently, it is necessary to have a sufficiently large financial mechanism that really "unties" science and technology organizations and scientists.

4.3. Regarding the perspective of developing Law on Science and Technology and solutions to improve policies and laws on science and technology in Vietnam in the coming time

4.3.1. Regarding perspectives on Developing Law on Science and Technology (amended)

Currently, in Vietnam, it is vital to assess the need to develop a new Law on Science and Technology instead of proposing to Law on Science and Technology (amended). Accordingly, stemming from practical needs, from the renovation perspective of the Party and State, it is necessary to comprehensively amend the Law on Science and Technology with many strong innovation perspectives to meet the country's development requirements in the case of the fourth industrial revolution taking place strongly over the world. Hence, the new Law on Science and Technology needs to reflect the Party's and the State's important new views and guidelines in the field of science and technology. If only amending and supplementing a number of current Laws on Science and Technology, it will be difficult to thoroughly understand and well implement the policy of considering "the development of science and technology as the top national policy", and it will be difficult to have breakthrough mechanisms to attract and utilize talents, promote innovation, and strongly apply science and technology. Besides, the new Law also needs to show the policy of focusing on proper investment in basic research; develop new mechanisms for risky investment in science and technology to promote science and technology development and innovation. As follows:

First, comprehensively amending the Law on Science and Technology with many new policies to reflect the role of the development of science and technology is crucial. That is the role recognized in Article 62 of the 2013 Constitution: *"Science and technology development is the top national policy, playing a key part in the country's socio-economic development. The State prioritizes investment and encourages organizations and individuals to invest in researching, developing, transfering, and*

effectively applying the achievements of science and technology.". However, from the point of view of the Ministry of Science and Technology on the proposal to develop the Law on Science and Technology (amended). Accordingly, the Ministry of Science and Technology propoes 15 policies, including many policies to implement the policy of developing science and technology as the top national policy. The recognition of the above 15 policies with the plan to amend and supplement a number of current Law on Science and Technology will have many difficulties and it will be difficult to ensure systematicism. For example, the State's policy of giving priority to investment in research, development, transfer, and effective application of science and technology achievements is reflected in Policy 5 (Creating favorable conditions for investment and finance for science, technology and innovation). The objective of this policy is "Prioritize investment in science, technology and innovation one step ahead; Have a roadmap to increase the ratio of state budget expenditure to GDP for research and development, striving to reach the rate of the top 3 ASEAN countries by 2030, approaching the average rate of Organisation for Economic Co-operation and Development countries". However, the view of the Ministry of Science and Technology in the Law on Science and Technology (amended) that inherits Clause 1, Article 49 of the Law on Science and Technology in 2013 is not feasible: "The State ensures expenditures on science, technology and innovation on average over a period of 5 years corresponding to the period of the 5-year socio-economic development plan from 2% or more of the total state budget expenditure and gradually increase according to the development requirements of the cause of science, technology and innovation" while setting the goal of "striving to reach the rate of the top 3 ASEAN countries by 2030, approaching the average rate of Organisation for Economic Co-operation and Development countries. Annual investment in science and technology in Vietnam is now lower than 2%. According to statistics of the World Organization for Economic Co-operation and Development (Organisation for Economic Co-operation and Development) in 2022 on the percentage of science and technology (R&D) funding to the total national income of some countries, Vietnam is in the lowest group, 0.4%. In Southeast Asia, Singapore and Thailand are the countries with this high rate, both many times higher than Vietnam (Thuy Van, 2021).

Second, the new Law on Science and Technology (comprehensively amending the current Law on Science and Technology) needs to institutionalize the guiding view of recognizing breakthrough mechanisms to attract and respect talents, promote innovation and vigorously apply science and technology. Synchronously developing a system of legal regulations on introduction, training, attraction, appreciation, evaluation and use of scientific and technological talents is vital. Talents need to be seen as the trigger point creating breakthroughs. Talents, especially talents in the field of science and technology, are the most important factor that can promote the development of science and technology in Vietnam. Therefore, in order to improve the quality and create breakthroughs in training and fostering talents, the new Law on Science and Technology needs to stipulate important policies and contents such as: (1) Criteria for identifying "talents" in the context of international integration and the fourth industrial revolution strong taking place; (2) Policies and institutions on training, fostering, evaluating and employing talents; (3) Mechanism for evaluating and monitoring the process of introducing, nomination and recognition of talents in

accordance with Vietnamese conditions to ensure openness, transparency and democracy; Remediation mechanism if there are errors or irregularities in introducing and recommending talents; (4) Build a talent market to encourage the free movement of talents on the basis of law, create talent competition, and promote socio-economic development. If assigning the task of stipulating all of the above contents to the Government, it is not commensurate with the importance of the policy of attracting and utilizing talents for science and technology development.

Third, the new Law on Science and Technology needs to recognize the contents of policies interested in investing in basic research. International experience shows that focusing on basic research is a strategic path to help these countries consolidate and enhance their potential, qualifications and scientific position to lead the world, not only for socio-economic development, but also for solving problems of the future, transnational issues related to the safety and security of people, the environment and the Earth. For developing countries like Vietnam, investing in basic research is also investing in the future of the country's science and technology; contributing to the development of highly qualified human resources at the frontline of knowledge, especially at the postgraduate level; strengthening the foundation, research capacity and talented scientific staff in universities and research institutes; thereby increasing the capacity to anticipate, absorb, apply and develop new research directions and advanced technologies of the world to serve the national sustainable development goals. Because, right from the 80s of the twentieth century, our Party and State soon realized the importance of investing in basic research. Since then, the Party's guiding view throughout the development stages of the country has always been to attach importance to the role of basic research because investment in this field is an investment in the foundation and future of the country's science and technology. The 13th Party Congress continued to inherit the above-mentioned guiding view, continuing to affirm the need to "*pay attention to proper investment in basic research*; *focus on research and application of core technology and digital technology*" (Communist Party of Vietnam, 2021). The Strategy for Science and Technology Development and Innovation to 2030 also identifies "the need to build modern basic science, focusing on application-oriented basic research to move towards creativity, autonomy and technological competitiveness in key areas that Vietnam needs, potential and advantages." Moreover, not only stopping at recognizing the mechanism of focusing on basic research and paying attention to proper investment in basic research, *the new Law on Science and Technology needs to recognize the role of increasing proper investment in basic research as a fundamental factor to create breakthroughs in the development of science, technology and innovation for the sustainable development of the country*. There needs to be systematic regulations on basic research funding; scholarships and supports for researchers to conduct basic research, invest in building basic research infrastructure, training programs and develop human resources in the field of basic research.

Fourth, promulgating the new Law on Science and Technology is appropriate when building a new mechanism for risky investment in science and technology with the intention of promoting science, technology and innovation activities. It is right for the State to take risks in scientific research in the current context, but it is not enough. Accordingly, if is necessary to have a new mechanism for investment in science and

technology. Risk investment in science and technology is the provision of funding and support for technological research and development projects that have a high level of risk and uncertainty about outcomes, including the development of developing new technologies, doing basic research in the fields of science and medicine, or testing new applications of existing technology. In this area, projects often require a lot of research and testing, and the final results may not be guaranteed or unpredictable. Risk investments for science and technology are usually made by financial institutions such as hedge funds, private investors or governments through special support policies and programs. The goal of risky investing is to encourage innovation and creativity, while facilitating the development of new and cutting-edge solutions. However, due to its high uncertainty and risk, this investment often needs to be accompanied by strict quality management and risk assessment mechanisms, as well as provisions for benefit sharing and intellectual property rights.

4.3.2. Recommendations for completing policies and laws on science and technology in Vietnam for the upcoming time

Firstly, it is about completing the policy on salary and income for scientific human resources in general and scientists in particular. Currently, the state budget's investment in science and technology mainly invests in products but has not focused on investment to develop science and technology resources (human capital). Therefore, an effective working environment and a satisfactory income regime for science and technology human resources are solutions to encourage scientists to feel secure in research, intellectual dedication, and spend a lot of time on research activities to have good and useful initiatives, creative and innovative products to contribute to the country's science and technology development in particular with national construction and development in general. Besides, in order for the policy of employing scientists to be effective, it is necessary to grant autonomy in science and technology activities such as the right to decide to work, the right to actively use allocated budget funds, the right to research cooperation; Administrative procedures for registration, implementation and acceptance of topics should also be streamlined; Information technology advances should also be applied to this management so as to simplify the process of implementing scientific research topics.

Secondly, it is about updating and supplementing policies to suit the country's new development stage. Currently, in order to promptly adjust and renew policies of the State on developing science and technology and innovating in the new context, it is necessary to note a number of new policies as follows:

(i) Renovate institutions in science, technology and innovation, as well as complete the new structure to promote national capacity.

(ii) Respect the right to academic freedom, research and develop science and technology and innovate; Preserve the legitimate rights and interests of human resources in science, technology and innovation in choosing topics, exploring unknown scientific fields, participating in basic research, applied research, strategic research, interdisciplinary research in the public interest;

(iii) The State improves the effective national innovation system together with science and technology innovation;

(iv) The State maximizes the important part of science, technology and

innovation research institutions, establishments engaged in science, technology and innovation activities, as well as encourages higher education institutions to participate in scientific research, develop technology and social services, train highly qualified experts with a sense of social responsibility and spirit of innovation, etc.

(v) Assign the government to add an additional provision on sandbox (controlled testing mechanism).

Thirdly, it is necessary to have policies that create favorable conditions of investment and finance for science, technology and innovation. Accordingly, it is necessary to conduct a survey on financial sources from the state budget for activities about doing research on science and technology, thereby determining a certain allocation rate for expenditure on science and technology tasks. Simultaneously, it is necessary to to continue to arrange and promote the autonomy mechanism for public S&T organizations so as to attract and improve the efficiency of using national, sectoral, regional, domestic and foreign resources; to create conditions for higher education institutions, especially national key universities, to strengthen teaching activities associated with researching and developing science, technology and innovation, to promote basic and applied research in areas in which Vietnam has strengths.

5. Conclusion

Now, in order to meet the requirements and catch up with the trend of science and technology development in the world, the issue of perfecting policies and laws on science and technology in Vietnam is very necessary. Specially in the face of the requirements of reality in Vietnam, it is required that policies and laws on science and technology must be untied and promote the effectiveness of science, technology and innovation activities. In which, amending and supplementing regulations in accordance with management practices and ensuring conditions for science and technology to play the role of a leading national policy, having a positive impact on economic and social development, improving productivity, quality and competitiveness of products and goods, contributing more and more effectively to economic growth in Vietnam in the coming time. With the set recommendations, it is hoped that in the coming time, it will become scientific bases for policymakers and managers to refer to and use for the process of amending and supplementing Law on Science and Technology in 2013.

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