DEVELOPING HUMAN RESOURCES FOR SCIENCE AND TECHNOLOGY IN SOUTHEAST VIETNAM AFTER ADMINISTRATIVE MERGER: TOWARD SUSTAINABILITY AND CLIMATE ADAPTATION

Le Thi Le [(1)]
(1) Thu Dau Mot University
Corresponding author: letl@tdmu.edu.vn

Article Info

Abstract

The administrative merger in Southeast Vietnam has fundamentally reshaped regional governance, spatial configurations, and development priorities, creating urgent requirements for a more integrated approach to science and technology (S&T) human resource development. To assess the implications of this restructuring, the study employs a mixed-methods design that combines institutional diagnostics, comparative policy analysis, and quantitative evaluation of workforce indicators. Empirical data are sourced from national statistical agencies, ministerial datasets, provincial development reports, and international benchmarking studies. The analysis focuses on the S&T workforce within the newly configured administrative units of expanded Ho Chi Minh City, Dong Nai, and Tay Ninh, examining competency structures, spatial distribution, coordination mechanisms, and post-merger system dynamics. The findings reveal significant disparities in qualification profiles, weak cross-provincial linkages in training and research, and limited alignment between workforce planning and emergent regional development trajectories. Despite these constraints, the merger presents opportunities to consolidate training capacity, strengthen innovation networks, and enhance talent mobility. The study argues for a coordinated regional S&T human resource strategy supported by institutional harmonization, a functionally differentiated training system, AI-enabled workforce planning tools, and expanded regional–national–international cooperation to advance a knowledge-based, climate-adaptive development pathway for Southeast Vietnam.

1. Introduction

Science and technology (S&T) human resources encompass individuals with advanced expertise, proficient skills, and innovative capabilities in research, technology development, and innovation. This workforce includes researchers, lecturers, specialists, engineers, and technology managers (OECD, 2015). In the context of sustainable

development, where the economic, social, and environmental pillars must be harmonized, S&T human capital serves as a cornerstone in translating knowledge into practical applications. Such contributions are critical for informing national policy, enhancing labor productivity, conserving natural resources, and responding to global challenges such as climate change and energy crises (UNESCO, 2022; Nguyen Minh Tri et al., 2024).

Sustainable development requires a solid knowledge base and advanced technological capacity. Both depend directly on the quality and scale of S&T human resources. These individuals form the core of a knowledge economy, drive innovation ecosystems, and enable the transition to circular, green, and digital development models (World Bank, 2020). At the local level, S&T personnel play a guiding role in localizing solutions and tailoring responses to regional conditions, ensuring equitable and effective territorial development.

An innovation ecosystem refers to a dynamic network comprising academic institutions, research centers, enterprises, government bodies, and communities that share common goals of knowledge creation and technology transfer (Etzkowitz & Leydesdorff, 2000; Bayramova, 2024). Within such systems, S&T human capital functions both as a "creative agent" and a "catalyst" across all stages of innovation.

Climate change is increasingly posing unprecedented risks—drought, saltwater intrusion, soil erosion, and extreme weather events, especially in Southeast Vietnam where diverse topography and rapid urban-industrial expansion have exacerbated vulnerability. Addressing climate challenges requires not only financial and infrastructural investment but also strong endogenous technological capacity to analyze, forecast, and formulate adaptive strategies (IPCC, 2022; Thanh et al., 2025). Developing S&T human capital within innovation ecosystems is therefore a prerequisite for designing climate strategies rooted in local needs and ownership, as opposed to externally imposed solutions (Truong, 2016; IDIA, 2021).

Against the backdrop of administrative reforms aimed at streamlining governance structures, the Vietnamese government has initiated the merger of several administrative units to enhance regional coordination and resource efficiency. For the Southeast—Vietnam's most economically dynamic region, this restructuring carries strategic implications (Vu Van Hung, 2019; Nguyen Trong H., 2023). Beyond mere redistricting, the merger has triggered significant shifts in organizational structures, spatial planning, population distribution, and the governance of socio-economic and technological resources. The consolidation of former provinces into a newly expanded Ho Chi Minh City has produced a "mega-urban" area with formidable industrial, service, and research capacities. However, it also presents challenges related to policy harmonization, regional governance, and equitable development between core and peripheral areas (Le Hung, 2025). Similar considerations apply to the restructured provinces of Dong Nai and Tay Ninh, which now require comprehensive overhauls in education, research infrastructure, budgeting, and inter-provincial collaboration.

S&T human capital is increasingly pivotal in shaping regional development models. These individuals not only spearhead innovation, competitiveness, and industrial modernization but also lead research, forecasting, and policy design to adapt to climate change, particularly critical in coastal provinces like Ba Ria-Vung Tau province or transitional wetland zones such as Long An province (Nguyen Le Thuy, 2024; IPCC, 2022). Fragmentation, uneven distribution, and lack of coordination in the current S&T workforce pose serious risks to the sustainable and integrated development of the region.

In this new phase of development, the newly formed administrative units must adopt a strategic, cross-regional approach to S&T human capital development. Such a strategy should integrate education, research and development (R&D), institutional–industry linkages, and local innovation ecosystems, all while aligning with the Fourth Industrial Revolution and ongoing green and digital transitions.

Recent studies have emphasized the central role of S&T human resources in enhancing regional resilience and sustainable growth amid escalating environmental risks. According to the Global Innovation Index by Cornell University (2022), high-performing economic regions share robust innovation ecosystems supported by open, interconnected, and interdisciplinary talent development programs. A recent European study further highlighted that digital capability and green skills are key indicators of resilience to the twin crises of climate and technology (Herrera Herbert, 2024).

Notably, in the Asia–Pacific region, where Vietnam is actively engaging in regional integration, a new wave of spatial restructuring is unfolding under the concept of mega-regions. Here, S&T human capital is viewed as a "soft backbone" underpinning institutional reform and economic transformation (UNESCAP, 2023). A synthesis of evidence from China by Hongqi Ma et al. (2024) suggests that underinvestment in human capital can delay sustainable transitions and lead to intra-regional disparities. Therefore, planning for S&T workforce development in post-merger Southeast Vietnam requires a systems-based, multidisciplinary, and climate- and digital-informed approach.

2. Research Methodology

This study adopts a mixed-methods approach, integrating both qualitative and quantitative techniques to assess the current state of S&T human resource development in Southeast Vietnam following administrative restructuring, and to formulate corresponding policy recommendations. The specific methods are as follows:

• Qualitative methods were employed to examine existing policies, review international best practices, and analyze relevant legal and regulatory frameworks concerning human resources, innovation, and sustainable development.

• Quantitative methods involved statistical analysis of data on S&T human resources, disaggregated by occupational sector, educational attainment, and regional distribution. Data sources included official statistics from the General Statistics Office, the Ministry of Science and Technology (MOST), and provincial government reports.

In addition, the study utilized various analytical tools such as comparative charts, SWOT matrices, and hierarchical schematics to highlight key trends and support the formulation of targeted policy recommendations.

3. Results and Discussion

3.1. International Experiences in Developing Regional S&T Human Resources after Administrative Restructuring

3.1.1. China

Following sweeping administrative reforms since the 1990s, China established a network of special economic zones and mega-regions, notably the Guangdong–Hong Kong–Macau Greater Bay Area (Investcorp, 2022). The central government launched the "Mass Entrepreneurship and

Innovation" strategy, whereby innovation hubs are concentrated in core metropolitan centers, while neighboring merged provinces function as suppliers of technical manpower and hubs for applied R&D. This model exemplifies the integration of three strategic dimensions, human resources, spatial planning, and institutional governance, serving as a foundational mechanism for sustaining regional innovation capacity.

3.1.2. South Korea

In the context of administrative decentralization and regional smart city development, South Korea has made significant investments in a network of Regional Innovation Centers across provinces such as Gyeonggi and Jeolla. These centers not only conduct research but also operate under the "Triple Helix" framework, linking academia, industry, and local government. They offer financial packages to support both individuals and institutions engaged in local S&T activities. This system has proven effective in retaining talent in provincial areas and enhancing regional innovation indices (Lee et al., 2016).

3.1.3. Singapore

Although Singapore operates as a city-state, it has adopted a tiered approach to human capital development through its national "Skills Future" program. This initiative emphasizes continuous, interdisciplinary, and flexible education and training. Following the restructuring of its key research agencies (A*STAR, NTU, and NUS), the country has shifted its focus from traditional workforce training to building an innovation-centric human capital ecosystem. The government provides substantial funding to support individuals, tech startups, and R&D organizations. This policy framework has proven particularly effective in enhancing the agility and global competitiveness of Singapore's S&T workforce (Singapore Government, 2025).

3.1.4. Germany

Germany's "Innovations region" (Innovation Region) model is grounded in strong decentralization, granting local authorities' considerable autonomy in planning training programs and setting technological priorities. Cities such as Leipzig and Munich, following administrative restructuring, prioritized the development of S&T human resource clusters through collaborative networks involving federal, local, and private-sector partners. This flexible approach to workforce planning has enabled Germany to maintain its technological edge and strengthen its resilience to climate change, especially in areas such as renewable energy and environmental technologies (Clusterplattform Deutschland, 2025).

3.2. Current Status of S&T Human Resources in Southeast Vietnam Before and After the Administrative Merger

3.2.1. S&T Workforce Profile by Province Prior to the Merger

Prior to the administrative restructuring initiative, the Southeast Vietnam comprised seven provinces and centrally governed cities, including Ho Chi Minh City, Binh Duong province, Dong Nai province, Ba Ria–Vung Tau province, Long An province, Binh Phuoc province, and Tay Ninh province. Strategically located and economically dynamic, the region contributed approximately 32% of national GDP and 44.7% of total state budget revenue (Tran Ba Tho, 2023). It also hosts a high concentration of universities, research institutes, high-tech parks, and foreign direct investment (FDI) enterprises, forming one of the country's most vibrant innovation ecosystems.

Ho Chi Minh City is the nation's foremost science and technology hub, home to over 100 higher education institutions, nearly 60 research institutes, and three high-tech zones. The city employs over 400,000 people in S&T-related fields, with the highest proportion of postgraduate-qualified personnel in the country. It also serves as a key node in the national innovation network (Nguyen Trong H, 2023).

Binh Duong province stands out for its industrial and logistics strengths. However, its S&T workforce is predominantly composed of mid-level technicians and vocationally trained personnel. The province faces significant shortages of high-level R&D experts and engineers in core technologies and remains heavily reliant on talent trained in Ho Chi Minh City (Tran Ba Tho, 2023).

Ba Ria–Vung Tau province holds considerable potential in offshore petroleum exploitation, marine science, and environmental technology. Its S&T workforce is concentrated in large entities such as Vietsovpetro and several specialized petroleum research institutes. However, effective linkages with the local innovation ecosystem remain limited (MOST, 2021).

Dong Nai province serves as a key industrial province with over 30 operational industrial zones. Its S&T personnel are mainly engineers and technical workers, while high-level researchers and technology specialists are in short supply. The province's university–research–industry collaborations are still nascent and have yet to produce robust technology value chains (Tran Ba Tho, 2023).

Binh Phuoc province, Tay Ninh province, and Long An province represent transitional provinces shifting from agriculture to industrial development. These localities face notable constraints in both the quality and quantity of S&T human resources. The proportion of highly skilled labor remains low, with most concentrated at the vocational and associate degree levels. Scientific research infrastructure is underdeveloped, with many areas lacking standardized laboratories or functional R&D centers (Binh Duong Department of Science and Technology, 2019).

Overall, although the Southeast Vietnam contributes significantly to national economic growth, there are stark disparities in the quality and scale of S&T human resources across its constituent provinces. These imbalances underscore the urgent need for policies that promote equitable investment allocation, targeted workforce training, and the development of region-wide, integrated science and technology ecosystems.

3.2.2. SWOT Analysis of S&T Human Resource Development Post-Merger

a. Strengths

The administrative restructuring and territorial expansion of the Southeast Vietnam offer several distinct advantages for the development of S&T human resources:

Post-merger, the region's enlarged scale encompasses multiple economic and technological growth poles, including Ho Chi Minh City, Binh Duong province, and Dong Nai province. These areas are home to numerous industrial parks, high-tech zones, research centers, and dynamic innovation networks.

The region hosts thousands of FDI enterprises, major corporations, and tech startups, thereby generating strong and stable demand for highly qualified S&T personnel in fields

such as mechatronics, advanced materials, smart logistics, and clean energy. This contributes to the formation of a diverse and vibrant enterprise ecosystem.

It concentrates many of the country's leading education and research institutions, particularly in Ho Chi Minh City, which has the highest density of universities and research institutes in Vietnam. This urban core plays a critical role in supplying high-quality human resources and driving technology transfer and innovation across the broader region.

Innovation ecosystems within the newly merged administrative entities are expected to continue developing. A notable example is Binh Duong province's Smart City model, which has established a relatively modern technology ecosystem that connects government, enterprises, and academic institutions in guiding S&T human resource development.

b. Weaknesses

Despite these strengths, several challenges persist in the post-merger context, especially regarding disparities in S&T human resource development:

Provinces such as Long An, Binh Phuoc, and Tay Ninh still have weak S&T foundations, fragmented training and research systems, and limited linkages with major centers such as Ho Chi Minh City or Dong Nai province. This results in significant disparities between central urban areas and peripheral regions.

The absence of regional coordination bodies and interprovincial mechanisms for managing S&T human resources may lead to unhealthy competition for talent among provinces, rather than fostering collaboration and resource-sharing.

Many universities and colleges in the region offer training programs that are misaligned with the actual labor demands of local industries, particularly in peri-urban and rural areas.

Highly skilled labor in smaller provinces tends to migrate toward Ho Chi Minh City for better opportunities, exacerbating "brain drain" and hindering the sustainable development of local S&T ecosystems.

c. Challenges

The consolidation of administrative units presents institutional and resource-based challenges in harmonizing the organization and management of S&T human resources:

Integrating human resource planning into regional development strategies requires alignment in budgeting, governance, and workforce policies, which remain inconsistent across the newly merged provinces.

The restructuring of the education and training system, especially curriculum reform, must respond to regional development goals while ensuring interprovincial compatibility, flexibility, and relevance to emerging S&T skill demands such as artificial intelligence, big data, and green technologies (Tran Ba Tho, 2023).

Furthermore, equitable and sustainable development must be safeguarded. Without proper mechanisms for resource sharing and support to underdeveloped areas, administrative restructuring may widen interprovincial disparities and destabilize regional S&T workforce dynamics.

d. Opportunities

The merger creates favorable conditions for the formation of inter-regional S&T talent clusters and facilitates workforce connectivity across localities. Ho Chi Minh City can

serve as a central hub for disseminating technological knowledge and expertise to surrounding provinces such as Binh Duong, Tay Ninh, and Long An.

Educational institutions may adopt distributed but integrated training models, with flexible curricula shared across provinces and enhanced through digital learning platforms and enterprise-linked work-based training programs.

The region's expanded scale and diversified ecosystem enhance its potential to attract high-tech investment and international cooperation, making it appealing to investors and global organizations in the fields of education and human capital development, especially in emerging technology sectors.
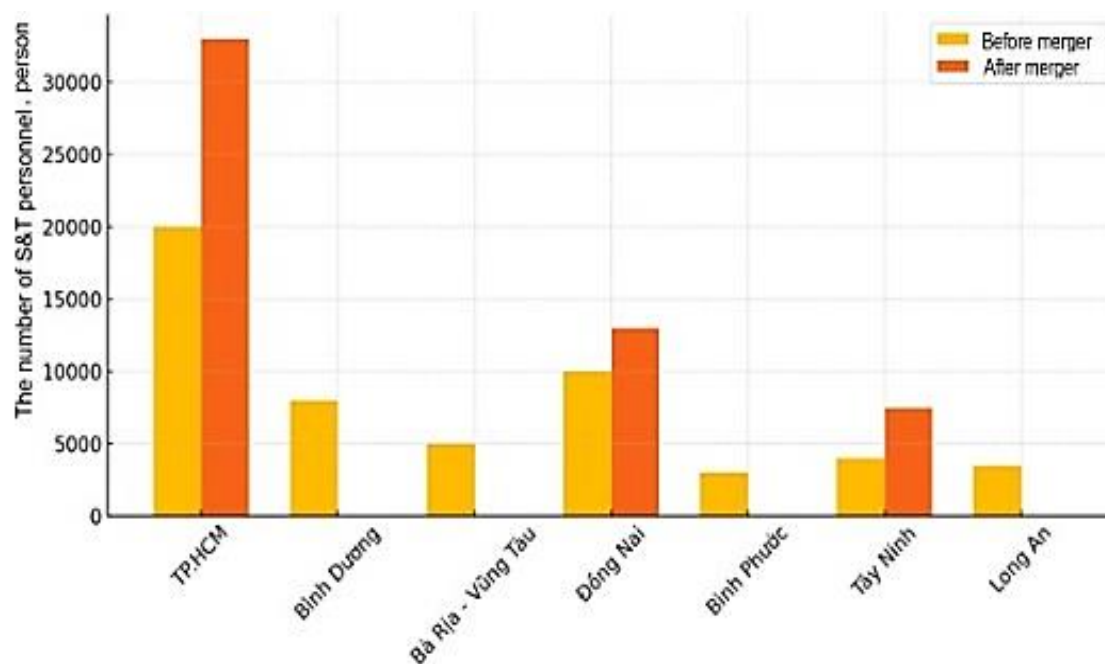

Figure 1. Comparison of S&T human resources before and after the merger
(Sources: Trần Bá Thọ, 2023; Nguyen Trong H., 2023)

3.2.3. Impacts of the Merger on the Planning, Allocation, and Utilization of S&T Human Resources

The administrative restructuring and territorial redefinition of Southeast Vietnam not only influence public administration but also exert profound effects on the planning, allocation, and utilization of S&T human resources across the region. From a supply-demand perspective, changes in regional scale and structure are expected to generate the following outcomes:

• Reintegration of S&T workforce planning into regional master plans: Merged provinces need to review and revise their human resource development strategies in alignment with a regional integration approach to avoid fragmented or overlapping initiatives and ineffective investment. Training programs and talent recruitment strategies must be synchronized with the socio-economic and S&T development goals of the entire region.

• Formation of interprovincial S&T corridors: Centered around Ho Chi Minh City, which hosts a concentration of research institutes, universities, and technology enterprises, S&T corridors can extend to industrial and high-tech zones in Binh Duong province,

Dong Nai province, and Long An province. These corridors can facilitate the mobility of experts, students, faculty, and research equipment, enhance infrastructure efficiency and narrowing competency gaps between provinces.

- Promotion of a center–satellite human resource allocation model: Deploying S&T professionals to peripheral areas requires supportive policies such as hardship allowances, housing, conducive working environments, and career advancement opportunities for those based outside major urban centers. Such incentives are critical to mitigate brain drain from smaller provinces.

- Increased competition for high-quality talent among provinces: As the region evolves into a unified technological and economic zone, local governments must adopt flexible, sector-specific, and locally adapted talent attraction mechanisms (e.g., targeted policies for AI, biotechnology, or renewable energy) to retain skilled S&T personnel who might otherwise gravitate toward large metropolitan areas.

- Emergence of the need for a regional S&T workforce database: Effective workforce planning requires the creation of an integrated information system that consolidates data on current S&T human resources, professional capacities, spatial distribution, and training needs. Such a system would support interprovincial coordination and evidence-based policy-making.

3.2.4. Existing Policies and Programs Related to Training, Development, and Talent Attraction

While each province in the Southeast has implemented its own policies to develop S&T human capital, these efforts remain largely fragmented and lack regional coordination:

- Ho Chi Minh City has launched the "High-Level Human Resource Development Program to 2030," prioritizing sectors such as R&D, tech startups, and digital transformation. The city government invests in scholarships, postdoctoral research, early-career academic development, and innovation incubators at institutions like Vietnam National University-Ho Chi Minh City (HCMC) and HCMC University of Technology (HCMCPV Portal, 2025).

- Binh Duong province promotes its Smart City model in collaboration with Eastern International University and technology corporations, offering short- and medium-term training programs tailored to enterprise and industrial zone demands (Binh Duong Department of Science and Technology, 2019). The province also plans to establish a regional S&T institute to connect research resources across localities.

- Dong Nai province has enacted multiple policies to support S&T enterprises through tax incentives and by facilitating the establishment of R&D centers in industrial zones such as Long Thanh and Nhon Trach (Dong Nai People's Council, 2023). The province also collaborates with universities in Ho Chi Minh City to establish satellite training centers for advanced technical skills.

- In contrast, Tay Ninh, Long An, and Binh Phuoc provinces lag in formulating comprehensive S&T human resource policies. Current efforts are limited to scholarship support and incentives for postgraduate study, with no specific programs to attract leading experts or significant investments in research and laboratory infrastructure (Binh Phuoc Provincial People's Committee, 2023).

- In summary, current programs are predominantly provincial in scope, lacking strategic integration at the regional level. No interprovincial coordinating body or cohesive regional human resource development strategy exists, resulting in fragmented training, resource allocation, and workforce utilization.

- Therefore, it is essential to formulate a "Southeast Vietnam S&T Human Resource Development Strategy 2025–2045", focusing on: establishing a regional coordination mechanism, developing a shared human resource database, clearly assigning training and research responsibilities among provinces, and designing interprovincial financial instruments to support priority sectors and high-potential talent.

3.3. Sustainable Development Orientation and Climate Adaptation in Southeast Vietnam

3.3.1. Environmental and Climate-Specific Challenges

While Southeast Vietnam is one of the country's most economically dynamic regions, it is also highly vulnerable to the adverse impacts of climate change and environmental degradation. These risks are intensifying due to rapid urbanization, industrial expansion, and decades of unregulated natural resource exploitation. Importantly, such issues transcend individual provinces and manifest as interlinked regional challenges, necessitating systemic thinking and long-term adaptation strategies.

One pressing threat is sea-level rise and saline intrusion, which significantly affects coastal provinces such as Ba Ria–Vung Tau and Long An. According to projections by the Ministry of Natural Resources and Environment (2021), a 100 cm rise in sea level could inundate approximately 8% of Ho Chi Minh City's land area and 15% of Long An province's agricultural land, posing severe risks to ecosystems, agriculture, and coastal infrastructure.

Riverbank erosion and land degradation are escalating along the Saigon and Dong Nai rivers, as well as districts bordering Cambodia. These phenomena have caused direct economic losses to thousands of households and threaten critical transport infrastructure and residential areas (Nguyen Le Thuy, 2024). Such impacts are exacerbated by land-use changes, sand mining, and the absence of adequate shoreline protection measures.

Drought and water scarcity during the dry season are becoming critical issues in Binh Phuoc and Tay Ninh provinces heavily reliant on surface water and characterized by large-scale land conversion from forest to industrial crops such as rubber and cashew. Land-use transformation and ecosystem degradation in buffer zones have reduced the landscape's natural water retention capacity, increasing water stress for both production and daily use.

Environmental pollution, especially air and water pollution and industrial waste has exceeded permissible thresholds in several industrial hubs, including Ho Chi Minh City, Binh Duong province, Dong Nai province, and Ba Ria–Vung Tau province. Elevated levels of fine particulate matter (PM2.5), heavy metals in industrial wastewater, and surface water contamination present major challenges to public health and green economic development (Nguyen Quoc Nghi, 2011).

Overall, the region's environmental challenges are multisectoral and cross-regional in nature. Addressing them effectively requires close interprovincial coordination in land-

use planning, water resource protection, and the establishment of proactive, evidence-based climate monitoring and response systems.

3.3.2. Innovation-Driven and Technology-Based Approaches to Sustainable Development

Given the increasing complexity of the environmental and climate challenges, Southeast Vietnam must move beyond traditional infrastructure-based solutions and instead adopt science, technology, and innovation (STI) as foundational pillars for sustainable development. This shift requires the integration of modern technologies, circular and green economic models, and the enhancement of endogenous innovation capacities into regional planning processes.

First, the region must transition from an extensive growth model to an intensive one, focusing on increasing value-added output through digital technologies, artificial intelligence (AI), big data, and the Internet of Things (IoT). Smart value chains in processing industries, logistics, and smart cities will serve as new engines for green growth (World Bank, 2021).

Second, there is a need to scale up the application of climate technologies in natural resource management, environmental monitoring, and emissions assessment. Tools such as IoT-based environmental sensor systems, AI-integrated climate forecasting models, and automated carbon accounting platforms can empower local authorities to make more timely and accurate decisions (UNESCO, 2022).

Third, investments in R&D capacity across universities, research institutes, and high-tech zones are essential to localize technology and improve knowledge transfer to businesses (World Bank, 2020). This approach not only reduces dependency on imported technologies but also strengthens local resilience to global disruptions.

In addition, the private sector must be incentivized to adopt advanced technologies particularly in green materials, renewable energy, and circular production models. Green finance mechanisms, tax incentives, and regional innovation support funds should be tailored to facilitate private sector engagement in sustainability initiatives.

Lastly, the quality and quantity of S&T human resources must be significantly enhanced, particularly in interdisciplinary fields such as environmental management, green technologies, and digital transformation. Integrated training programs, lifelong learning schemes, and on-site learning initiatives should be widely implemented, especially in underdeveloped provinces.

Thus, S&T must not be viewed merely as a "supporting tool," but rather positioned at the core of the Southeastern region's development strategy. Achieving sustainable development in this area requires a strong integration of innovation, inter-provincial coordination, and sustainable finance, thereby fostering robust endogenous capacities to proactively and effectively adapt to climate change and digital transformation.
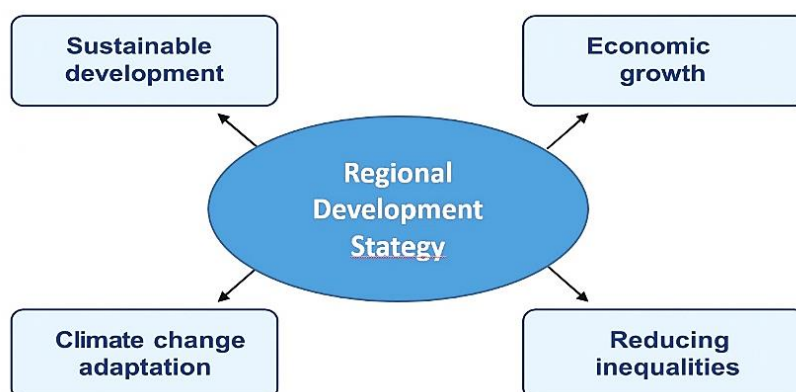
Figure 2. Strategic regional development framework linked to S&T human resources
(Sources: Etzkowitz & Leydesdorff, 2000; UNESCO, 2022)

3.4. Solutions for the Development of S&T Human Resources in the Southeastern Region Post-Merger

3.4.1. Institutional and Policy Solutions

The establishment of three new administrative entities necessitates a coherent institutional framework to manage and develop S&T human resources in a manner that is integrated, flexible, and tailored to the region's specific characteristics.

Develop an integrated regional S&T human resources development strategy through 2035, clearly identifying occupational and skill demands by locality and defining the functional roles of urban, industrial, and agricultural centers.

Harmonize policies on training, remuneration, and utilization of S&T human resources among the merged provinces to avoid unhealthy competition and discrepancies that could lead to brain drain between sub-regions.

Establish an official regional linkage mechanism for training–research–deployment via a Southeastern S&T Coordination Council, comprising representatives from the Departments of Science and Technology, Departments of Education and Training, enterprises, and research institutes/universities.

3.4.2. Training and Capacity-Building Solutions

The quality of S&T human resources depends on the effectiveness of the education and continuous training system. Regional tiered and interconnected training will ensure specialization, practicality, and efficiency.

Tier the regional S&T training system:

- Ho Chi Minh City: responsible for postgraduate education, fundamental research, and innovation in high-tech sectors.

- Dong Nai province: focused on training industrial technicians, engineers in materials science, mechatronics, and automation.

- Tay Ninh and Long An Provinces: responsible for applied training in smart agriculture, environmental technology, and renewable energy.

- Strengthen university–research institute–enterprise collaboration through coordinated training programs, industry internships, and co-funded application-oriented research scholarships.
- Implement short-term, flexible, and online training programs (e-learning, blended learning) in emerging areas such as circular economy models, climate change adaptation, carbon accounting, and environmental risk management.

3.4.3. Solutions to Attract and Retain High-Quality Human Resources

Attracting top-tier S&T personnel to peripheral and less-developed areas requires breakthrough policies focused on quality of life, creativity, and professional development.

Apply flexible recruitment mechanisms and expand special contract regimes for high-profile and highly capable researchers, including both domestic experts and overseas Vietnamese.

Develop local innovation ecosystems, including open innovation hubs, technology incubators, co-working spaces, and open laboratories to support creative startups and technology transfer.

Build a regional network of mentors, experts, and scientists connected to a "Talent Reconnect" program aimed at engaging young intellectuals currently studying and working abroad in regional development efforts.

3.4.4. Solutions for Digital Transformation and AI Integration

Digital transformation serves not only as a support tool but also as the foundation for intelligent and adaptive monitoring, forecasting, and policymaking on human resources.

Establish a regional digital S&T human resource management system integrated with recruitment platforms, competency profiles, labor market demands, and interconnected training programs.

Apply machine learning and AI technologies to analyze skill transition trends, forecast labor demand by sector, and support long-term human resource development strategies.

Deploy interactive online dashboards visualizing skill maps, expert distribution, and the regional innovation ecosystem.

3.4.5. Regional–National–International Connectivity Solutions

The advancement of S&T human resources must be embedded within global innovation networks and academic–technological ecosystems.

Connect the Southeastern region's innovation ecosystem with the National Innovation Center and high-tech parks in Hanoi, Da Nang, and Can Tho cities to share infrastructure, resources, and technological markets.

Strengthen international cooperation in training and research through joint-degree programs and integration of master's and doctoral curricula with partners from the U.S., Japan, South Korea, Germany, Singapore, and others.

Collaborate with international organizations (e.g., UNDP, JICA, KOICA, AFD) to implement technical and financial support projects for S&T human resource development linked to climate change adaptation and green transition.

Figure 3. Summary of S&T human resource development solutions in the Southeast Vietnam after the administrative merger
(Sources: World Bank, 2020; Ho Chi Minh City Party Committee Portal, 2025)

3.5. Policy Recommendations

3.5.1. Recommendations for the Central Government and Ministries

To ensure effectiveness and consistency in the strategy for developing S&T human resources in the Southeastern region after the administrative merger, the Government should direct central ministries and agencies to implement the following tasks:

- Issue a Strategy for S&T Human Resource Development in the Southeastern Region for the period 2025–2035, with a regional integration vision and orientation toward climate adaptation, digital transformation, and green economy. This should be a branch under the National Human Resource Development Strategy.

- Authorize the Ministry of Science and Technology (MOST), Ministry of Home Affairs, and Ministry of Education and Training to jointly develop a legal framework for inter-provincial coordination in training, research, and human resource utilization. This framework will provide a basis for regional cooperation programs, medium-term budget allocations, and coordination of innovation networks.

Approve pilot mechanisms such as:

- Inter-provincial funds to support S&T experts working in remote and transitional areas.
- Scholarship–credit mechanisms for S&T training programs tied to employment commitments.
- High-level autonomy for public research centers in regional training and technology transfer collaboration.
- Promote international cooperation and support visa, financial, and administrative policies for overseas Vietnamese scientists and experts contributing to the Southeastern region.

3.5.2. Specific Recommendations for the Three Newly Established Administrative Units

The new provincial governments after the merger must proactively formulate distinct but interconnected action programs based on each locality's strengths:

Expanded Ho Chi Minh City should serve as the regional nucleus, with the following orientations:

• Establish a Regional Council for S&T Human Resource Development.

• Upgrade innovation infrastructure: expanded high-tech zones, AI centers, and regional key laboratories.

• Strengthen start-up support connected with universities and high-tech enterprises.

Expanded Dong Nai province should prioritize:

• Establishing application–technical training centers linked to industrial parks.

• Implementing "enterprise-sponsored training" and cooperative education programs.

• Forming an R&D cooperation zone among former Dong Nai, Binh Duong provinces, and Ho Chi Minh City along industrial and logistics corridors.

Expanded Tay Ninh province should focus on:

• Building agriculture–energy–environment technology training and experimental centers for rural development.

• Deploying online learning systems for remote areas focused on digital skills, disaster resilience, and resource management.

• Launching youth scientist engagement programs, tech volunteer initiatives, and expert mentorships for underdeveloped areas.

All three administrative units should jointly sign a Regional Cooperation Agreement on S&T human resource development, committing to data sharing, co-financing training programs, supporting expert mobility, and encouraging workforce circulation within the regional ecosystem.

3.5.3. Recommendations for Higher Education Institutions, Research Institutes, and Technology Enterprises

Higher education institutions, research institutes, and tech enterprises are foundational in training, developing, and utilizing S&T human resources. Their proactive and creative roles should be encouraged and enhanced:

For universities and research institutes:

• Promote academic autonomy and develop regionally adaptive training programs, especially those integrating digital skills, innovation, and environmental management.

• Establish inter-provincial applied research centers in priority fields (e.g., AI, renewable energy, environmental engineering).

• Expand international cooperation, including joint supervision of Master's and PhD programs and forming inter-regional scientific networks for sustainable development.

For technology enterprises and S&T firms:

• Participate in defining training outcomes, aligning educational programs with practical needs.

• Provide scholarships, sponsor applied research projects, and host internships for students and postgraduates.

- Invest in open innovation models, shared technology labs, and develop venture studios integrating enterprises, institutes, and universities.

4. Conclusion

The administrative restructuring of the Southeastern region, through the merger of seven provinces and cities into three new administrative units, marks the beginning of a new phase of transformative development. However, it also poses significant challenges in governance, development planning, and particularly in the management of S&T human resources. In this context, the development of S&T human capital is not only an urgent requirement to enhance regional competitiveness but also a foundational element for shaping a sustainable development model that is responsive to climate change and digital transformation.

Based on the analysis of the S&T human resource landscape before and after the merger, this paper identifies a range of structural challenges, including disparities in qualifications across provinces, a lack of regional coordination mechanisms, uneven distribution by sector and training level, and weak linkages between education, research, and the labor market. Nevertheless, the Southeastern region possesses considerable strengths, such as a dynamic system of universities and research institutes, a young labor force, a promising innovation ecosystem, and its strategic role as the national hub for industrial production and technology exports.

The role of S&T human resources in shaping post-merger regional development is both essential and irreplaceable. Beyond contributing directly to R&D and technological innovation, this workforce serves as a bridge connecting policy, markets, and communities, thereby transforming knowledge into practical value. Particularly in a region highly vulnerable to the impacts of climate change and environmental degradation, STI professionals are expected to lead in designing green development models, sustainable urban solutions, and low-emission value chains.

The findings emphasize the urgency of developing a regionally coordinated human resource development policy, rather than fragmented provincial approaches. This requires alignment across central and local governments, clearly defined roles within the training and research system, and flexible mechanisms for cooperation among universities, research institutes, and enterprises. Moreover, long-term visions must be realized through concrete strategies toward 2035–2045, aligned with goals for sustainable development, the circular economy, and comprehensive digital transformation.

In conclusion, the advancement of S&T human resources represents a dual lever—simultaneously boosting labor productivity and regional competitiveness while laying the groundwork for the Southeastern region to emerge as a national pioneer in achieving the Sustainable Development Goals in the 21st century.

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