BLUEBOOK

INSTITUT TEKNOLOGI KALIMANTAN

SCIENCE TECHNO PARK

Fostering Sustainable Development in Central Indonesia:
Establishing the Science Techno Park at Institut Teknologi Kalimantan As a Hub for Technology-Driven Innovations

August, 2024

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PREFACE

The establishment of the Science Techno Park (STP) at Institut Teknologi Kalimantan (ITK) marks a significant milestone in our commitment to fostering innovation, entrepreneurship, and technological advancement in the region. This initiative aligns with our vision of becoming a hub for technology-driven innovation, enhancing sustainable regional development, and contributing to Indonesia's global competitiveness by 2035. The STP at ITK is designed to bridge the gap between academia and industry, providing a comprehensive framework for the commercialization of research and development activities. By integrating cutting-edge facilities, diverse research clusters, and a strong network of collaborations, the STP aims to catalyze the growth of high-tech industries and support the broader socio-economic development of East Kalimantan and beyond. We express our gratitude to all stakeholders, partners, and contributors who have supported this endeavor. This document outlines the vision, strategies, project components, expected impacts, and recommendations for the successful implementation and sustainability of the STP at ITK.

Balikpapan, 1 August 2024

ITK Science Techno Park Team

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
BIE	Bioenergy Laboratory
BIP	Bioenergy Production Room
BTI	Business and Technology Incubation Office
CAF	Cafe
CIESRE	Center for Intelligent Energy System Research and Engineering
CoE	Centers of Excellence
COL	Collaboration Open Space
COM	Computer Cluster
DPL	Digital Platform and Application Dev Lab
DTI	Digital Twin and IoT Lab
ELM	Electro-materials Lab
EVM	Electric Vehicle Mini Plant
FCH	Food Characterization
FLE	Fluid Energy Laboratory
FMI	Food Mycrobiology Laboratory
GCR	Green Construction Room
GSP	Green Ship Production Lab
HAI	Halal Inspection Laboratory
HYO	Hydro & OTEC Power Plant
ICTSC	ICT for Smart City Cluster
IHT	Interactive Heritage Technology Lab
IKN	Indonesian Capital City
INC	Incubation Room
INN	Innovation Gallery
IoT	Internet of Things
IPS	Intellectual Property Services Office
ISC	Intelligent Sensing and Communication Lab
ITK	Institut Teknologi Kalimantan
JICA	Japan International Cooperation Agency
LMR	Large Meeting Room
LOB	Lobby Receptionist
LPDP	Indonesia Endowment Fund for Education
LPPM	Institute of Research and Community Services
MGIRC	Manufacturing and Green Industry Research Centre
MO	Management Office
MoU	Memorandum of Understanding
MSE	Marine Systems Engineering
MSW	Marine System Workshop
MUL	Multifunctional Expo Room
NWI	Network and Infrastructure
ODA	Official Development Assistance
PAR	Partnership Office
PCC	Process and computation control laboratory
PIU	Project Implementation Unit
PLA	Pilot Plant
PLN	State Electricity Company
PRP	Prototyping Room

PRR	Prototyping Room
R&D	R&D Product Support Services Office
RDMP	Refinery Development Master Plan
ROO	Rooftop Garden/Green Building Space
SCCB	Center for Sustainable Creative City of Borneo
SDGs	Sustainable Development Goals
SIL	Silent Room
SIM	SIMT Laboratory
SMR	Small Meeting Room
SMS	Smart Energy System Laboratory
SOE	Solar Energy Laboratory
SSW	Smart Solar and Wind Farm
STEM	science, technology, engineering, and mathematics
STF	Staff Room
STP	Science Techno Park
SUI	Sustainable Infrastructure Lab
SVR	Server Room
TEA	Teaching Room
TEC	Technical Services Office
TRL	Technology Readiness Level

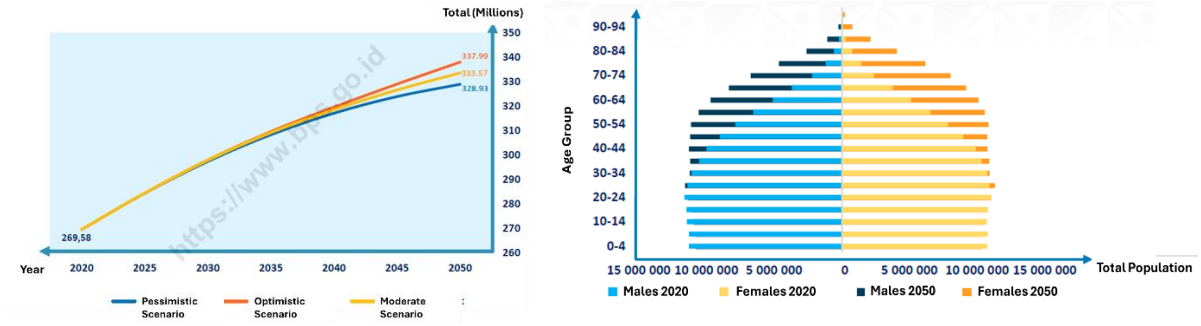
CHAPTER 1
BACKGROUND

1.1 National Context

1.1.1 Indonesian Socioeconomic Conditions

Indonesia, an archipelago of over 17,000 islands, boasts a population of more than 270 million people, making it the fourth most populous country in the world. The nation has shown impressive economic resilience, achieving an average GDP growth rate of around 5% per year before the COVID-19 pandemic. The economy is characterized by a mix of agriculture, manufacturing, and services, with significant contributions from sectors such as palm oil, textiles, electronics, automotive, and tourism. However, despite these achievements, Indonesia faces several socioeconomic challenges, including a high level of income inequality, regional disparities in development, and a significant portion of the population still living below the poverty line.

In recent years, the government has implemented various policies to address these challenges. Social assistance programs have been expanded to reduce poverty and inequality, while investments in infrastructure aim to improve connectivity and spur regional development. Education and healthcare reforms are ongoing to enhance human capital and ensure more inclusive growth. Additionally, Indonesia focuses on digital transformation to improve public services and increase economic competitiveness. The combined efforts aim to create a more balanced and sustainable economic development across the country.



(a) (b)

Figure 1.1 Indonesia population by 2050: (a) Population number from 2020 to 2050, (b) Age pyramids 2020 and 2050

(Source: https://www.bps.go.id/id/publication/2023/05/16/fad83131cd3bb9be3bb2a657/proyeksi-penduduk-indonesia-2020-2050-hasil-sensus-penduduk-2020.html)

As in Figure 1.1, population projections using trend, optimistic, and moderate scenarios show relatively similar results for Indonesia's population from 2020 to 2030. In 2020, the base population for all scenarios was 269.58 million. By 2030, the trend scenario projects a population of 297.43 million, an optimistic scenario of 298.03 million, and a moderate scenario of 297.88 million. Annual growth rates for 2020-2030 range from 0.99% to 1.01%.

By 2035, the trend scenario predicts a population of 308.37 million, while the optimistic scenario projects 309.63 million, and the moderate scenario 309.22 million. By 2050, the population under the trend scenario will reach 328.93 million, under the optimistic scenario 337.99 million, and the moderate scenario 333.57 million. The annual growth rate for 2035-2050 is 0.43% for the trend scenario, 0.59% for the optimistic scenario, and 0.51% for the moderate scenario. Overall, the average annual growth rate from 2020 to 2050 is 0.67% for the trend scenario, 0.76% for the optimistic scenario, and 0.71% for the moderate scenario. This suggests a demographic shift towards a larger but more slowly growing population.

The population pyramid for 2050 reveals a youthful demographic structure, with a large base indicating a high number of young people. This demographic trend suggests that Indonesia will continue to have a substantial workforce, but it will also face challenges related to providing education, employment, and healthcare for a growing young population. The narrowing at the top of the pyramid indicates fewer older individuals, reflecting a relatively lower burden of elderly care compared to countries with older populations. These demographic trends highlight the importance of sustainable economic policies and social infrastructure to support a growing and youthful population. Investing in education, healthcare, and job creation will be crucial for leveraging the potential of this demographic advantage while addressing the socioeconomic challenges it presents.

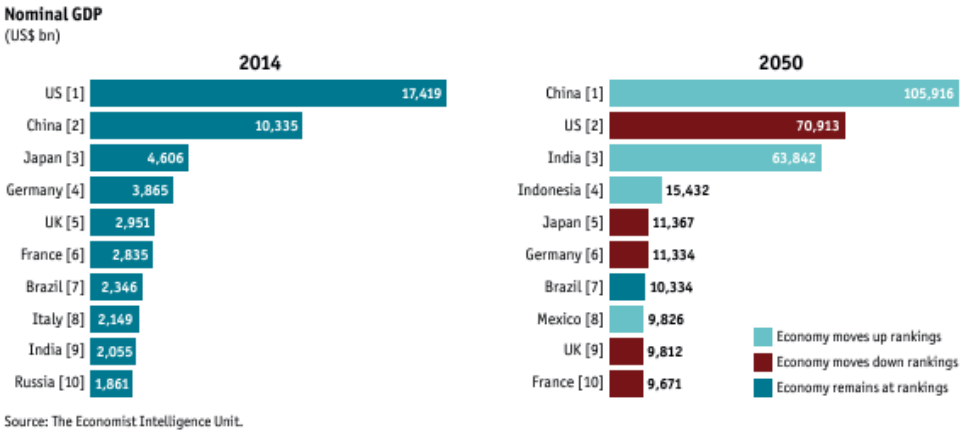


Figure 1.2 Indonesia's GDP rises in 2050

(Source: https://espas.secure.europarl.europa.eu/orbis/system/files/generated/document/en/Long-termMacroeconomicForecasts_KeyTrends.pdf,https://www.pwc.com/gx/en/world-2050/assets/pwc-world-in-2050-summary-report-feb-2017.pdf)

In terms of GDP, Figure 1.2 illustrates significant shifts in global economic power from 2014 to 2050. By 2050, Indonesia is projected to rise dramatically from outside the top ten to the 4th largest economy globally, with a GDP of $15,432 billion. This substantial growth reflects Indonesia's rapid economic development and increasing global influence. Meanwhile, traditional economic powers such as Japan and Germany are expected to decline in the rankings. This change emphasizes the rising importance of emerging markets in the global economy. The rise of Asia is not a recent development; Japan and South Korea experienced significant growth in the latter half of the 20th century. Entering the new millennium, many Asian economies saw another surge, boosting their share of global GDP from 26% to 32% between 2000 and 2014. Long-term forecasts indicate that Asia's ascent will persist up to 2050, albeit at a slower pace, ultimately representing 53% of global GDP by mid-century.

1.1.2 Medium-long-term Goals

Indonesia's Vision 2045 outlines the country's ambition to become a high-income nation by its centenary year. The vision is built on four pillars: human development and mastery of science and technology, sustainable economic development, equitable development, and the preservation of national identity and culture. By 2045, Indonesia aims to achieve a GDP per capita of USD 30,300, which would place it among the high-income nations. This goal is underpinned by strategies to enhance industrialization, boost technological innovation, and strengthen the education and healthcare systems. The government is also committed to achieving sustainable development goals (SDGs) as part of its long-term vision. Environmental sustainability, resource management, and climate change mitigation are integral to the nation's development plans. Indonesia aims to reduce greenhouse gas emissions, increase the use of renewable energy, and promote green industries. Additionally, the vision includes improving governance and

institutional frameworks to support economic and social development, ensuring that growth benefits all segments of society.

To accelerate the realization of the Vision of the Unitary State of the Republic of Indonesia, the President has introduced "Indonesia's Dream 2015-2085," which includes the following goals:

1. Indonesian human resources with intelligence surpassing other nations.
2. An Indonesian society that upholds pluralism, culture, religiosity, and ethical values.
3. Indonesia as a global center for education, technology, and civilization.
4. A society and government apparatus free from corruption.
5. Equitable infrastructure development across Indonesia.
6. Indonesia as a self-reliant and influential country in the Asia-Pacific.
7. Indonesia as a global economic growth barometer.

To achieve this dream, Vision Indonesia 2045 was formulated with four pillars:

1. Human Development and Mastery of Science and Technology.
2. Sustainable Economic Development.
3. Equitable Development.
4. Strengthening National Resilience and Governance.

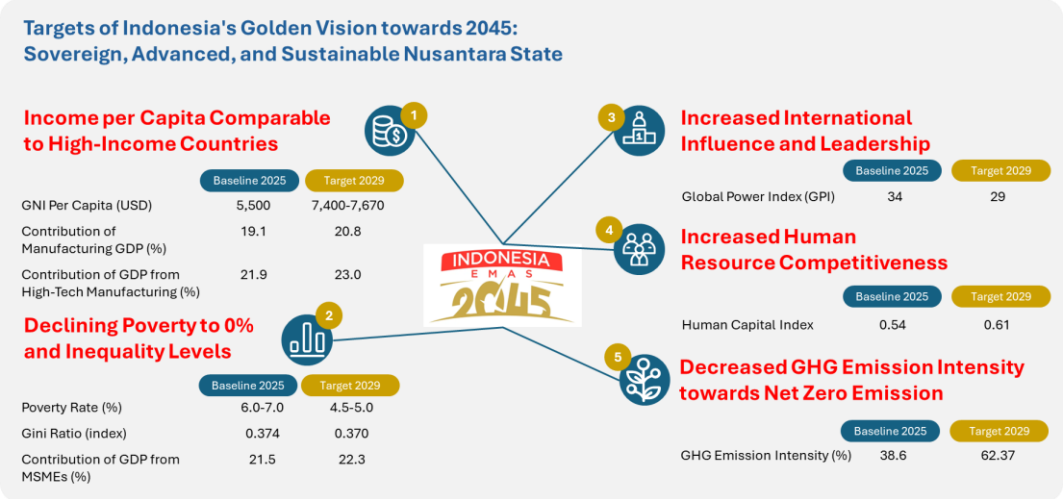


Figure 1.3 Vision of Indonesia Gold 2045

Figure 1.3 outlines Indonesia's ambitious goals for its Vision 2045, aiming to become a sovereign, advanced, and sustainable nation. First, it targets a significant increase in per capita income, with Gross National Income (GNI) rising from $5,500 in 2022 to $23,199 by 2045. It also aims to boost maritime GDP contribution from 6.4% to 12% and manufacturing GDP from 20.8% to 29.3%. Second, the vision seeks to eradicate poverty, reducing the poverty rate from 9.4% to 0% and improving income equality, as indicated by a reduction in the Gini ratio from 0.379 to 0.328. The GDP contribution from Eastern Indonesia is expected to increase from 21.5% to 23%. Third, Indonesia aims to enhance its global leadership and influence, improving its ranking in the Global Power Index from 34th to 29th. Fourth, human resource competitiveness will be improved, with the Human Capital Index rising from 0.54 to 0.61. Lastly, the vision includes a strong environmental focus, aiming to reduce emissions intensity from 38.6% to 62.37% to move towards net zero emissions. These targets reflect Indonesia's commitment to economic growth, social equity, international influence, and environmental sustainability by 2045.

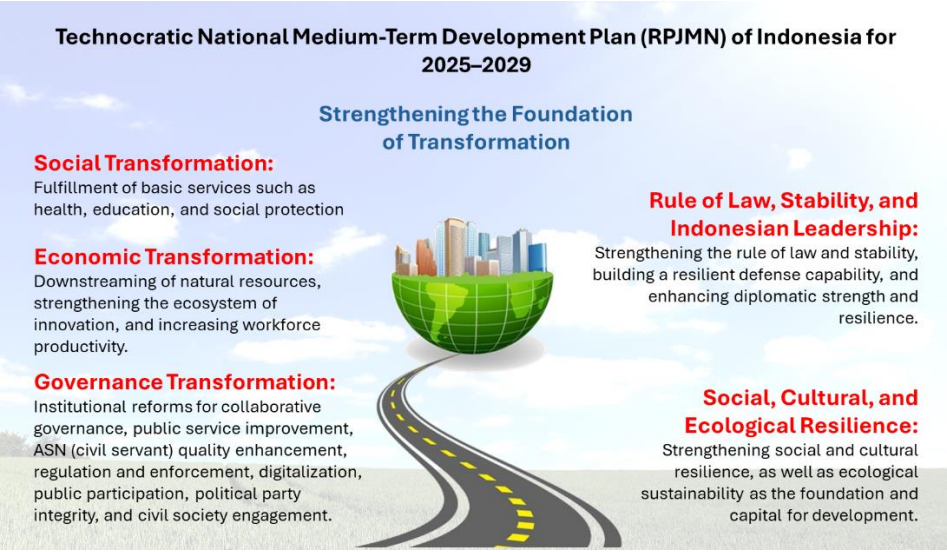


Figure 1.4 Themes and policy directions of middle-term goals

Figure 1.4 shows the themes and policy directions of Indonesia's Technocratic RPJMN for 2025-2029, focusing on strengthening the foundation for transformation. It emphasizes social transformation through improved health, education, and social protection services; economic transformation via resource-based industrialization and workforce productivity; and governance transformation with collaborative institutions, effective regulations, digital public services, political integrity, and community empowerment. Additionally, it highlights the importance of legal supremacy, stability, leadership, and strengthening socio-cultural and ecological resilience for sustainable development.

1.1.3 STP Policy

The policy framework for the establishment and development of Science Techno Parks (STPs) in Indonesia is articulated through several key regulations:

- **Presidential Regulation No. 106 of 2017:** This regulation outlines the national strategy for the establishment of Science Techno Parks across Indonesia. It provides the foundation for creating environments that foster innovation, research, and technological development. The goal is to support the growth of high-tech industries, promote collaboration between academia, industry, and government, and enhance Indonesia's global competitiveness in science and technology.
- **Ministerial Regulation No. 25 of 2019 (Permenristekdikti)**: This regulation, issued by the Ministry of Research, Technology, and Higher Education (now part of the Ministry of Education, Culture, Research, and Technology), specifies the operational guidelines for Science Techno Parks. It details the criteria for STP establishment, management, and evaluation. The regulation aims to ensure that STPs operate effectively, providing necessary infrastructure, support services, and fostering innovation ecosystems that are aligned with national development goals.

The establishment of Science Techno Parks (STPs) is a key policy initiative to drive innovation and technological advancement in Indonesia. STPs are designed to create ecosystems that facilitate collaboration between universities, research institutions, industries, and government agencies. These parks provide infrastructure, services, and support to foster research and development (R&D) activities, commercialization of technologies, and the growth of start-ups and high-tech industries. The goal is to enhance Indonesia's global competitiveness by fostering innovation and creating high-value jobs.

1.1.4 New Capital Development

The development of Indonesia's new capital city, Nusantara, in East Kalimantan is one of the most ambitious projects in the country's history. The relocation of the capital from Jakarta aims to alleviate the severe congestion, pollution, and land subsidence issues faced by the current capital. Nusantara is envisioned as a smart, green city that embodies sustainable development principles. The new capital will feature advanced infrastructure, extensive green spaces, and integrated public transportation systems, making it a model for future urban development in Indonesia.

The development of Nusantara is also seen as a catalyst for regional development in Kalimantan and other parts of eastern Indonesia. It is expected to spur economic activities, create jobs, and attract investments to the region. The government plans to develop key industries such as renewable energy, digital technology, and sustainable agriculture in the new capital. Moreover, the project aims to promote social inclusivity by ensuring that the benefits of development are shared with local communities. The success of Nusantara will be crucial in achieving Indonesia's broader goals of balanced regional development and environmental sustainability.

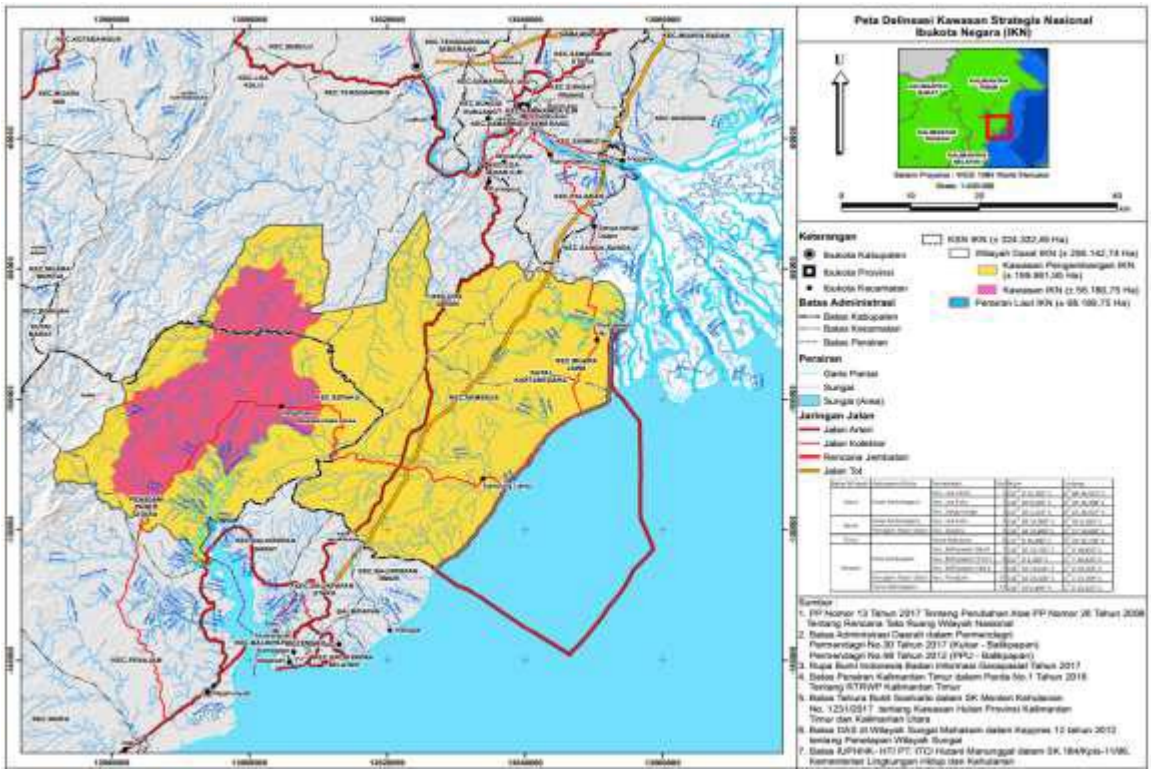


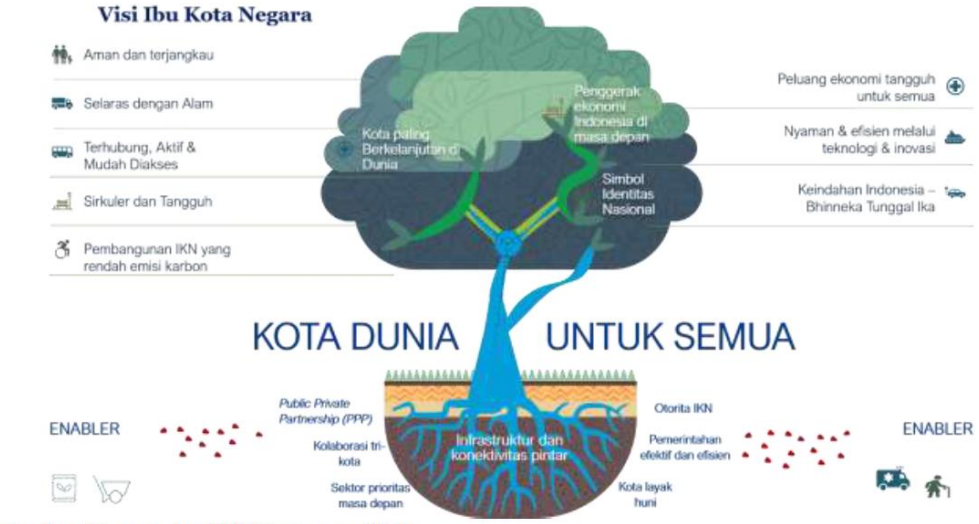
Figure 1.5 Map of the IKN Area and Existing Regency Boundaries

The IKN area is located north of Balikpapan and south of Samarinda, with a land area of approximately 256,142 hectares and a sea area of about 68,189 hectares, as shown in Figure 1.5. Administratively, the IKN (new capital city) area is situated between two regencies: Penajam Paser Utara Regency, covering Penajam and Sepaku Districts, and Kutai Kartanegara Regency, covering Loa Kulu, Loa Janan, Muara Jawa, and Samboja Districts. The IKN is bounded by Loa Kulu, Loa Janan, and Sanga-Sanga Districts of Kutai Kartanegara to the north, Penajam District of Penajam Paser Utara, Teluk Balikpapan, and Balikpapan's Barat, Utara, and Timur Districts to the south, the Makassar Strait to the east, and Loa Kulu District of Kutai Kartanegara and Sepaku District of Penajam Paser Utara to the west.

The new capital city (IKN) will act as an economic driver for Kalimantan and strengthen domestic value chains throughout Eastern Indonesia. The development of IKN will strategically position Indonesia in global trade routes, attract investment flows, and foster technological innovation. Additionally, IKN aims to serve as a model for green and sustainable urban development, driven by the latest technology. As depicted in Figure 1.6, the vision "A Global City for All" reflects not

only the future inhabitants but also the restored and preserved environment. The development vision of IKN is based on the following framework:

- National Identity: It will serve as a center reflecting Indonesia's identity, social character, unity, and greatness, showcasing the nation's uniqueness.
- Smart, Green, Beautiful, and Sustainable: The city will manage resources efficiently, provide effective services through sustainable water and energy use, waste management, integrated transportation, healthy environments, and synergy between natural and built environments. Planned as a forest city, it aims to maintain at least 50% green areas, supported by a robust Master Plan with minimal ecological, built environment, and social system risks.
- Modern with International Standards: The city will be progressive, innovative, and competitive in technology, architecture, urban planning, and social issues. It will feature world-class infrastructure and connections to other international urban centers.
- Effective and Efficient Governance: The relocation of central government institutions and decentralization of civil servants will enhance their capacity and potential through interconnected areas.
- Economic Equality Driver for Eastern Indonesia: One of the main goals is to develop clean, high-tech industries and promote globally competitive economic sectors.



Sumber: Kementerian PPN/Bappenas, 2019

Figure 1.6 Vision of IKN Nusantara as "A Global City for All"

1.2 Regional Context

1.2.1 Kalimantan and East Kalimantan: Socioeconomic Conditions and Challenges

Kalimantan, the Indonesian portion of Borneo, is rich in natural resources, including forests, minerals, and hydrocarbons. The island's economy is predominantly based on the extraction and export of these resources. However, this economic dependency poses several challenges:

- **Economic volatility and inequality**: reliance to natural resources exports, many residents face economic hardship and limited access.
- **Environmental degradation**: deforestation, forest fire, mining activities, water and air pollution, soil erosions, threatening the island's biodiversity, public health, and infrastructures.
- **Urbanization and Infrastructure gaps**: lack of adequate infrastructure for public services, including energy, clean water, transportation, healthcare, internet access, and education facilities.
- **Human capital development**: disparities in education quality and workforce skill levels with the demand of emerging downstream industries

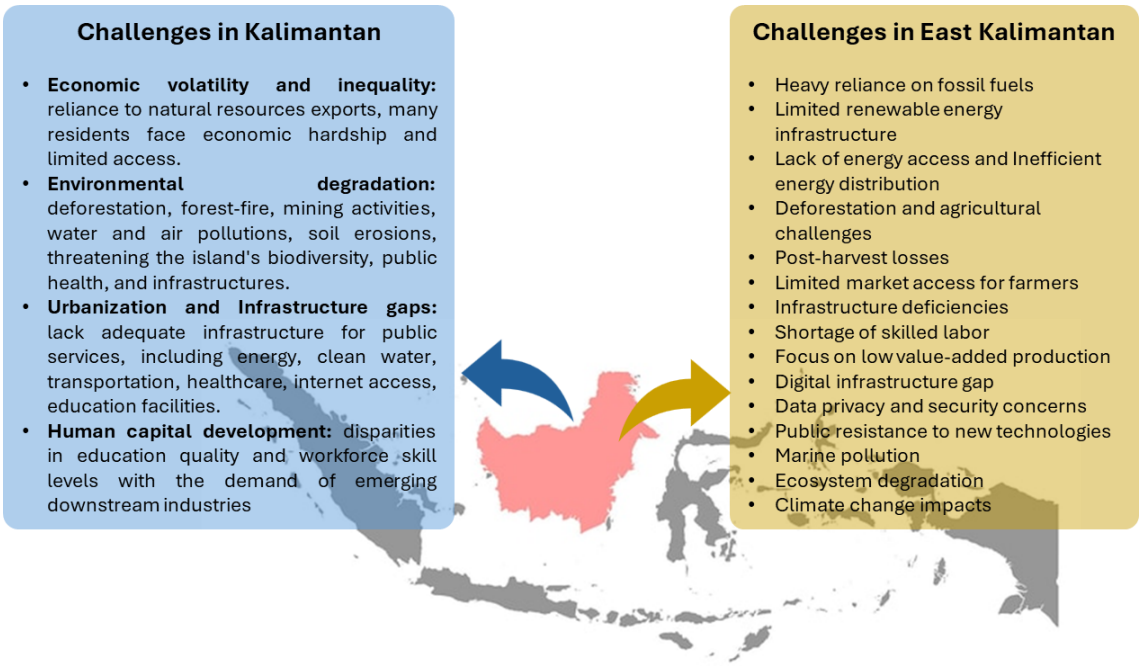


Figure 1.7 Challenges in Kalimantan and East Kalimantan

East Kalimantan, a key province on the island, is an economic hub with significant contributions from oil, gas, coal, and timber industries. The province faces its own set of socioeconomic challenges, as illustrated in Figure 1.7:

- **Heavy reliance on fossil fuels**: Kalimantan's energy sector predominantly uses coal, oil, and natural gas, causing significant environmental issues and economic volatility.
- **Limited renewable energy infrastructure**: Despite abundant potential for solar, hydro, and biomass energy, the region lacks the infrastructure needed to harness these resources.
- **Lack of energy access and Inefficient energy distribution:** Many rural areas still lack electricity, hindering socio-economic development and improving quality of life. Substantial losses occur during energy transmission and distribution, affecting the reliability and affordability of energy supplies.
- **Deforestation and agricultural challenges**: The expansion of plantations and deforestation reduce agricultural land, threatening food security and agricultural productivity.
- **Post-harvest losses**: Inefficiencies in storage and transportation lead to significant losses of agricultural products after harvest.
- **Limited market access for farmers**: Farmers often struggle to access markets for their products, limiting their income and economic growth opportunities.
- **Infrastructure deficiencies**: The region lacks adequate transportation, energy, and telecommunications infrastructure, crucial for industrial development and economic growth.
- **Shortage of skilled labor**: There is a shortage of skilled workers, which hampers the growth and competitiveness of the manufacturing and service sectors.
- **Focus on low value-added production**: Many industries produce low-value-added products, limiting economic benefits and growth potential.
- **Digital infrastructure gap**: A significant gap in digital infrastructure, including broadband connectivity and data centers, hinders the development of smart city technologies.

- **Data privacy and security concerns**: Ensuring the protection of personal and sensitive data is a challenge, especially with the growing adoption of digital technologies.
- **Public resistance to new technologies**: There is often resistance to adopting new technologies and changes in urban living, slowing down technological and infrastructural advancements.
- **Marine pollution**: Coastal waters are contaminated by industrial waste, oil spills, and improper waste disposal, leading to environmental and health concerns.
- **Ecosystem degradation**: The destruction of critical ecosystems like mangroves, coral reefs, and seagrass beds poses severe environmental challenges and reduces biodiversity.
- **Climate change impacts**: The region faces rising sea levels, changing weather patterns, and more frequent natural disasters, threatening both the environment and human livelihoods.

1.2.2 Medium-long-term Goals

Kalimantan's medium—to long-term goals, as depicted in Figure 1.8, focus on developing and transforming the region into a Superhub Economy of Nusantara. Each province within Kalimantan has a specific thematic focus aligned with its unique strengths and strategic importance.

Development Focus for Kalimantan

Nusantara Economic Superhub

"Center for agglomeration and new economic development based on future economic clusters to promote economic equity in Eastern Indonesia"

No	Province	Focus
1	West Kalimantan	The front porch of the nation and the center of value-added green industry
2	Central Kalimantan	National food barn and international conservation center
3	South Kalimantan	The logistics gateway of Kalimantan
4	East Kalimantan	The main driver of the economy in Eastern Indonesia
5	North Kalimantan	The front porch of the nation, the new and renewable energy hub of Kalimantan, and the center of sustainable green industry
6	Capital City (IKN)	Global city for all

Figure 1.8 The development plan of Kalimantan and Nusantara, according to the RPJMN

1. Kalimantan Barat (West Kalimantan) aims to become the "Gateway to the Nation" and a center for high-value green industry. The focus is developing sustainable industrial practices and enhancing the region's economic frontiers.
2. Kalimantan Tengah (Central Kalimantan) is envisioned as the "National Food Barn" and an international conservation center. The primary goal is to boost agricultural productivity and promote environmental conservation, balancing economic growth with ecological sustainability.
3. Kalimantan Selatan (South Kalimantan) targets becoming the "Logistics Gateway of Kalimantan." The province plans to enhance its logistics infrastructure to facilitate better connectivity and trade within and beyond Kalimantan.
4. Kalimantan Timur (East Kalimantan) is set to be the "Main Driver of the Eastern Indonesia Economy." The region aims to leverage its strategic location and resources to spur economic activities and contribute significantly to the national economy.
5. Kalimantan Utara (North Kalimantan) aspires to be the "Gateway to the Nation" as well, focusing on energy resources. The goals include developing new and renewable energy sources and establishing sustainable green industries.

6. Daerah Khusus Ibu Kota Nusantara (Special Capital Region of Nusantara) aims to become a "Global City for All." This area will serve as the new administrative and political hub of Indonesia, incorporating advanced infrastructure and international standards for a modern capital city.

To address these challenges and promote sustainable development, Kalimantan Island and East Kalimantan Province have outlined several medium-long-term goals:

1. Economic Diversification and Growth:
   - Transform Economic Structure: Shift the economic structure from reliance on natural resources to a productivity-based economy. This involves promoting sectors such as manufacturing, tourism, and agro-industries to reduce dependency on extractive industries.
   - Development of New Economic Sectors: Encourage the development of high-tech industries, including renewable energy and biotechnology. Support innovation and entrepreneurship through policy incentives and infrastructure development.
2. Sustainable Development:
   - Environmental Conservation: Implement comprehensive environmental policies focused on reforestation, sustainable mining, and conservation of biodiversity. This includes managing natural resources sustainably and promoting green and blue economy principles.
   - Green and Blue Economy: Embrace a green and blue economic approach, integrating sustainable practices in all economic activities, especially in sectors like mining and fisheries. Promote the use of renewable energy sources and sustainable agricultural practices.
3. Infrastructure Development:
   - Integrated Infrastructure Planning: Enhance transportation networks, digital connectivity, healthcare facilities, and educational institutions. Focus on developing integrated infrastructure systems that support economic activities and improve residents' quality of life.
   - Urban and Rural Development: Develop smart cities and modern urban areas that incorporate advanced technologies for better governance and efficient public service delivery. Improve rural infrastructure to bridge the urban-rural divide and ensure equitable development across the province.
4. Human Capital Development:
   - Enhancing Education and Skills: Invest in education and vocational training to build a skilled workforce. This involves improving the quality of education, promoting digital literacy, and aligning educational programs with industry needs.
   - Talent Management: Implement talent management and labor reform strategies to increase the competitiveness of the workforce. Develop programs to attract and retain talent in the region, particularly in high-tech and innovative sectors.
5. Innovation and Technology:
   - Promoting Research and Development: Establish research and development centers, technology parks, and incubators to foster a culture of innovation. Encourage collaboration between academia, industry, and government to drive technological advancements and commercialization of new technologies.
   - Digital Transformation: Promote the adoption of digital technologies across all sectors, improve digital infrastructure, and encourage businesses to integrate digital solutions into their operations.
6. Social and Cultural Development:
   - Improving Health and Education Services: Enhance the accessibility and quality of healthcare and education services. This includes building new facilities and upgrading existing ones to meet the growing needs of the population.

- Cultural Preservation and Promotion: Support initiatives that preserve and promote the region's cultural heritage. Develop cultural tourism and integrate local traditions and values into development plans.

1.2.3 Unique Opportunities and Advantages for STP Development in East Kalimantan

East Kalimantan presents unique opportunities and advantages for the establishment of a Science Technopark (STP):

- **Strategic Location:** Proximity to the new Indonesian capital, Nusantara, as well as the eastern part of Indonesia, provides a strategic advantage for collaboration and investment, positioning the STP as a central node in national development.
- **Resource Abundance:** The province's rich natural resources can support research and innovation in areas such as sustainable energy, environmental technologies, manufacturing, and resource management.
- **Government Commitment:** The Indonesian government's focus on developing the new capital and surrounding regions ensures strong support and investment in infrastructure and economic development projects. Therefore, it is timely to build the first STP in Kalimantan to solve regional challenges.
- **Collaborative Ecosystem:** The presence of universities, ITK and surounding research institutions, and emerging industries creates a fertile ground for partnerships and collaborative innovation, essential for the success of the STP.

CHAPTER 2
ITK STP VISION AND STRATEGY

2.1 Current Status and Challenges of Developing ITK STP

Institut Teknologi Kalimantan (ITK) was established in 2012 as part of the Masterplan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI). One of the grand plans is to expand access to higher education, especially in the central and eastern parts of Indonesia. At the time, higher educational institutions (HEI) with the basis of Science, Technology, Engineering, and Mathematics (STEM) in Kalimantan were limited compared to Java. When it was established in 2012, ITK, with its first 5 study programmes, collaborated temporarily with the Institut Teknologi Sepuluh Nopember (ITS) Surabaya to carry out the teaching activities. ITK was inaugurated by President Susilo Bambang Yudhoyono on October 6, 2014, as one of Perguruan Tinggi Negeri (PTNB) in Balikpapan. With the increasing number of study programmes, the number of students, and the readiness of the campus infrastructure in Balikpapan, ITK was moved from Surabaya and started operating in Balikpapan from 2015 to the present. Over the past 10 years, ITK has continued to develop in both academic and non-academic fields, such as increasing the number of study programs, lecturers, students, and building facilities.

The academic offerings at ITK have seen substantial growth over the years, as shown in Figure 2.1. In 2021, ITK offered 20 study programs, supported by 217 lecturers and serving 4,102 students. By 2022, the number of study programs increased to 22, with 234 lecturers and 5,367 students. This trend continued in 2023, with 241 lecturers and 4,809 students. By 2024, ITK had 22 study programs, 270 lecturers, and 6,087 students, reflecting a significant expansion in both academic offerings and student enrollment.

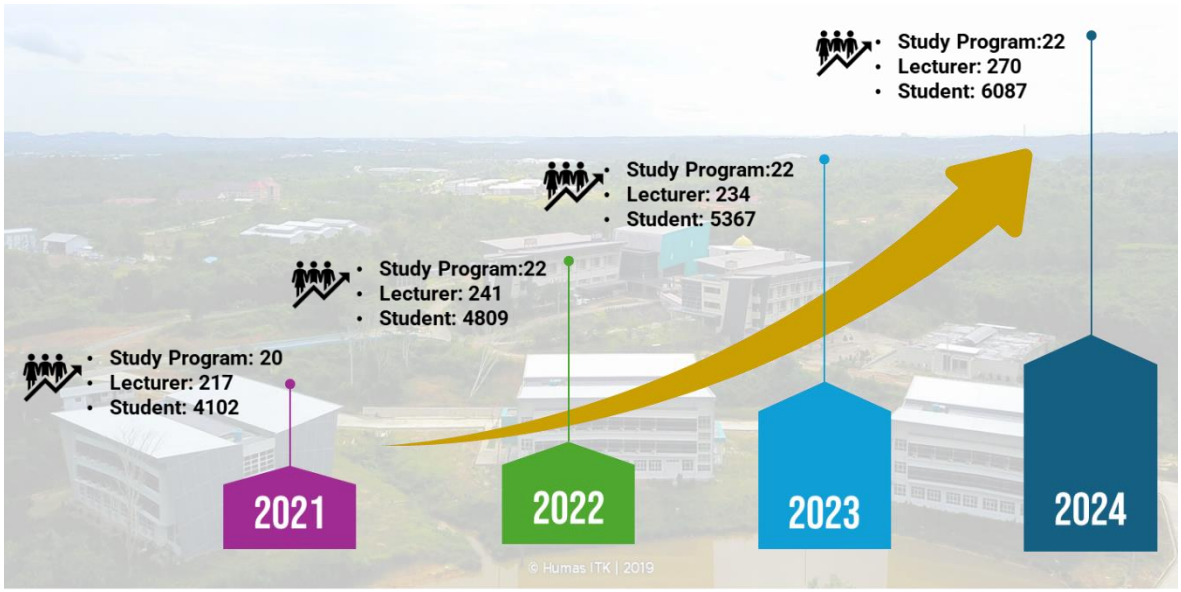


Figure 2.1 Academic capacity of ITK seen by the number of study programs, lecturer, and students

In terms of institutional achievements, ITK has garnered various accolades, as illustrated in Figure 2.2. In 2021, it ranked first in Key Performance Indicators (KPI) within the PTN SATKER League, second in Management of Cooperation Reports, third in Data Management of Cooperation, and first in Information Openness in the "Informative" category. In 2022, ITK excelled in Tracer Study Reporting and received the Public Relation Award, winning gold in categories like best social media, best webpage, and best integrated service unit. Further achievements in 2023 included obtaining international ASIIN Accreditation for eight study programs. ITK also won five awards at the Anugerah Diktiristek 2023, including Gold Winner for Social Media, Silver Winner for Integrated Service Unit, Press Release, and Public Relations Personnel, and Bronze Winner for International Cooperation Award. In 2024, ITK continued its

impressive trajectory by securing the second-place achievement award in Key Performance Indicators (KPI), attaining the highest positions in KPI 1 and KPI 4 Excellence, and receiving an award for the best use of the Cash Management System. These accomplishments highlight ITK's commitment to academic excellence and institutional growth.

Figure 2.2 ITK is leading in the new university league, marked by impressive achievements in recent years

ITK has set ambitious short to medium-term plans to enhance its academic and operational stature. In 2024, ITK will transition from a "satuan kerja" or new university to a "badan layanan umum," which will provide the institution with greater financial and operational autonomy. This shift aims to enable ITK to streamline its administrative processes and improve its service delivery. Looking ahead, ITK plans to launch a postgraduate program in Technology Management (Magister Manajemen Teknologi) in 2025. This program will cater to the growing demand for advanced expertise in technology management. Most importantly, ITK has developed a master plan to build advanced laboratory facilities and a Science Techno Park. These plans further solidify ITK's role as a leading institution in science, technology, engineering, and mathematics (STEM) education in the central and eastern parts of Indonesia.

Moreover, ITK's long-term development goals align with the broader objectives outlined in its Strategic Plan (RENSTRA), structured into three distinct phases. The first phase, from 2021 to 2025, focuses on establishing ITK as a "teaching university," prioritizing high-quality education and pedagogical development. In the second phase, from 2026 to 2030, ITK aims to evolve into an "excellence teaching university," enhancing academic standards and fostering a culture of excellence in teaching and learning. Finally, the third phase, from 2030 to 2035, envisions ITK transitioning into a "pre-research university," where research activities and downstream innovations will be significantly ramped up, laying the foundation for ITK to become a full-fledged research university. These long-term development goals are in line with the establishment of ITK STP, which will be expected to be operational after 2029.

2.1.1 Current Research and Innovation Capacity

Universities have a strategic role in strengthening the position of Science, Technology, and Arts (IPTEKS) as short-term, medium-term, and long-term investment capital for national development. Therefore, as a technology-focused institute in the eastern region of Indonesia, ITK always encourages and facilitates lecturers' production of more inventions and innovations that result in the downstream development of appropriate technology.

Figure 2.3 illustrates the distribution of research activities at Institut Teknologi Kalimantan (ITK) across different Technology Readiness Levels (TRLs), highlighting the institute's focus areas. A significant portion, 50%, is allocated to basic research, corresponding to TRL 1-3. This stage involves exploring fundamental principles and validating early-stage concepts in laboratory settings, forming the theoretical foundation necessary for future technological advancements. Meanwhile, 40% of the research is dedicated to TRL 4-6, where applied research efforts focus on

the validation and demonstration of technologies in relevant environments. This middle stage is crucial for bridging the gap between theoretical research and practical application, ensuring the feasibility and effectiveness of new technologies. The remaining 10% is concentrated on TRL 7-9, which involves advanced development and deployment, including prototype testing in operational environments and preparing technologies for market readiness. This balanced approach allows ITK to maintain a strong emphasis on basic research while also advancing technologies towards real-world applications and commercialization.

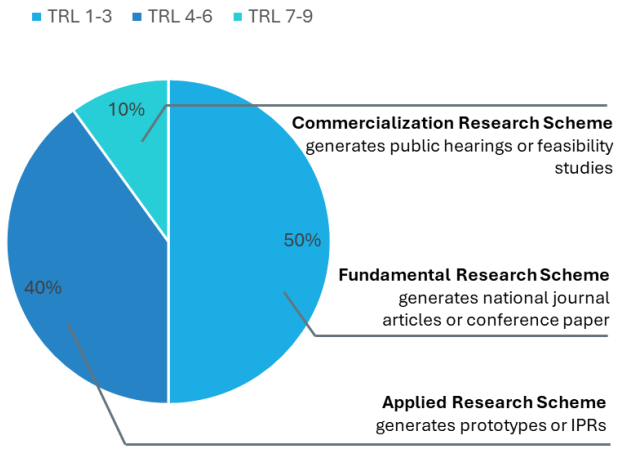


Figure 2.3 Research schemes in ITK based on TRL

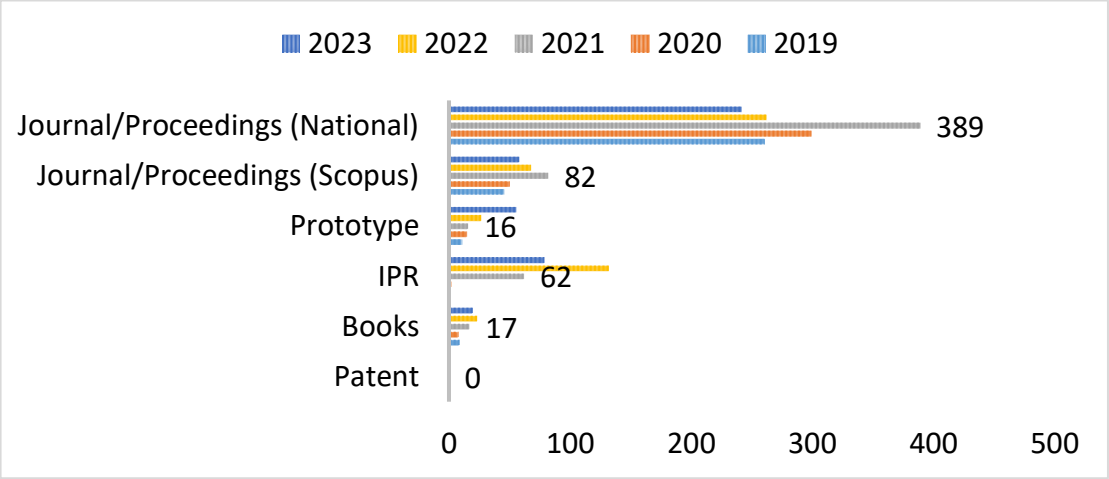


Figure 2.4 Research outcomes from 2019 to 2023

A summary of research outcomes from ITK between 2019 and 2023 is shown in Figure 2.4, categorized by different types of outputs. The most significant contributions are in national journal publications and conference proceedings, indicating a strong focus on engaging with national academic platforms. Internationally recognized outputs, with 82 publications in 2021 indexed in Scopus, reflect the institute's efforts to gain international visibility. In terms of innovation, ITK continuously developed prototypes and secured intellectual property rights (IPR), demonstrating its commitment to applied research and commercialization. Additionally, books were published consistently, contributing to academic and educational resources.

Funded Research

Faculty members at the Kalimantan Institute of Technology (ITK) actively engage in research activities, securing funding from various sources, including personal funds, ITK internal grants, and external grants from prestigious organizations such as the Ministry of Education, Culture, Research, and Technology, the Grant Riset Sawit, the Matching Fund, and the Indonesia Toray Science Foundation. The research projects funded by ITK encompass a wide range of technological levels, from research and development to deployment, each aligned with the project's Technology Readiness Level (TRL).

Currently, ITK faculty's research predominantly focuses on basic research, including fundamental and theoretical studies. To support the development of basic research, ITK offers an Innovation Research scheme, which targets TRLs 4 to 6. This scheme supports a variety of basic research topics to produce laboratory-scale products and prototypes. Furthermore, ITK facilitates the subsequent research stage through its Commercialization Research initiative. This initiative aims to support the practical application of research findings, ensuring that the results can be effectively translated into societal benefits.

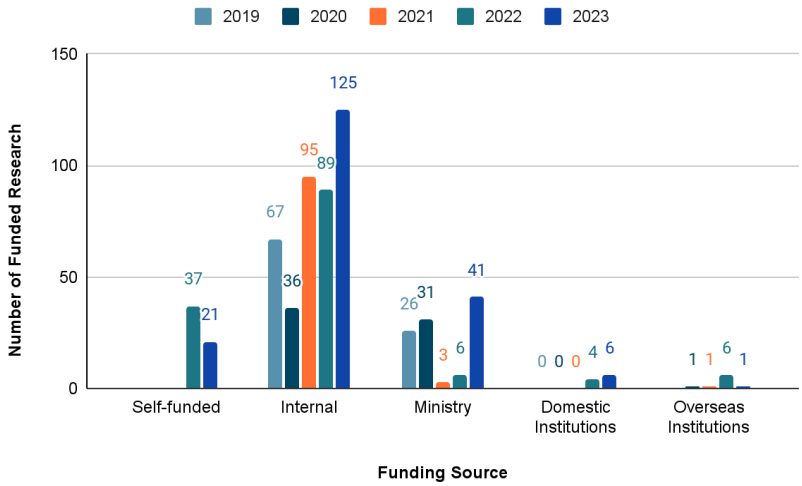


Figure 2.5 Number of research funded by various sources

Figure 2.5 shows that the largest source of research funding is internal institutional funding provided through ITK competitive grants. To support the involvement of lecturers in research, ITK, through LPPM, continues to increase the number of research grantees every year, and by 2023, the number has increased significantly to 125 titles. Based on the 2023 research data, there were 50 research in TRL 4-9, a two-fold increase from the 2022 data, which was 20 titles. Apart from internal funds, government funding through national competitive grants is also significant funding for lecturers in the ITK environment, which in 2023 reached 41 funded titles. Few other types of funding are domestic institutions such as the 2 to 3 Matching Fund program by the Ministry of Education and Culture and BRIN, and foreign institutions such as the Indonesia Toray Science Foundation (ITSF), which funds one research each year by ITK lecturers in collaboration with industry and other universities.

Funded Community Services

Several funding sources for community service activities obtained by ITK lecturers vary, ranging from internal to external sources. The amount of internal funding has been increasing yearly, even though the number of activities conducted fluctuates. This aims to improve the quality of community service activities so that the outputs from these activities can also be maximized. Several community service activities have begun to be conducted in collaboration with industry and the government, allowing the outputs to be directly utilized, one of which is through the Matching Fund funding scheme. Additionally, CSR funds from industry (for instance, Pertamina Hulu Mahakam) have been used by ITK lecturers to support the development of tourist villages. In 2024, activities funded by internal sources will be focused on developing appropriate technology in the Balikpapan area and its surroundings. In addition, one community service is funded by the Australian Government in the field of renewable energy.

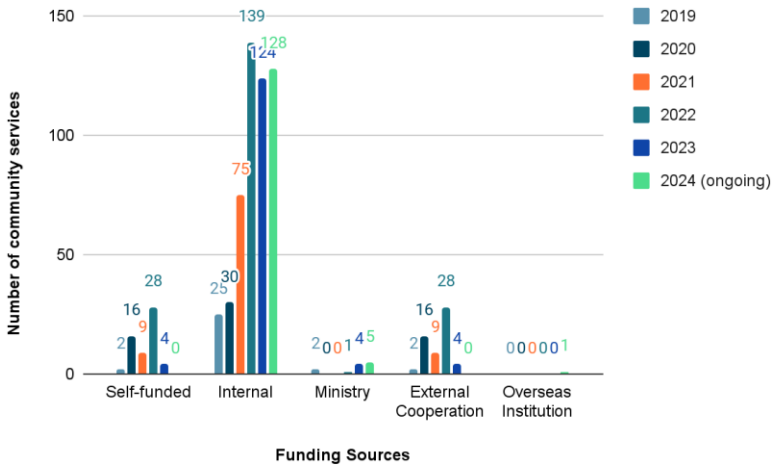


Figure 2.6 Number of community services and funding sources

Lecturers publish research findings through national and international publications to disseminate research within the community. Based on SINTA higher education clustering data, in 2024, ITK achieved the Intermediate cluster, an increase from the Pratama cluster in 2023. This shows a rising trend in the publication ecosystem, including journal articles, conference papers, and intellectual property rights.

Scientific Publications

In general, international publications resulting from the research of ITK lecturers and students tend to be low, reaching 82 articles in 2021. Although international publication data decreased the following year, it increased almost double in 2023. LPPM's efforts to increase the number of international publications are made through the funding policy requirement to publish in international publications and the implementation of international conferences with Scopus-indexed publications.

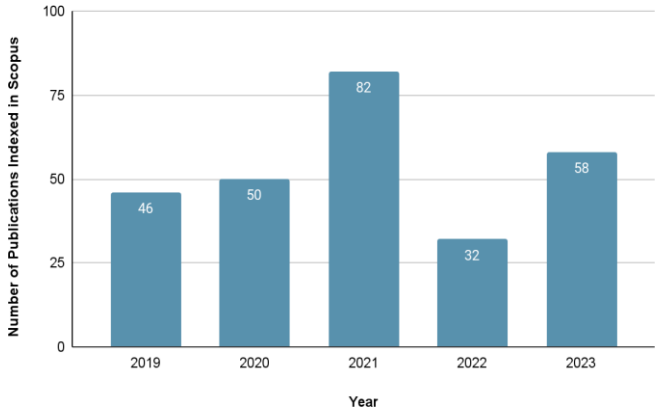


Figure 2.7 Number of publications indexed in Scopus

Intellectual Property

The bar chart in Figure 2.8 illustrates the number of intellectual property (IP) filings, specifically patents and copyrights, from 2020 to 2023. The data reveals a clear trend in patent filings over these four years. In 2020, the filings were minimal, with only 2 copyrights and no patents recorded. This number significantly increased in 2021, with 71 patents and 1 copyright being filed. The year 2022 marked a substantial spike in patent filings, reaching 222, indicating a significant boost in innovation and intellectual property activities. However, copyright filings remained at zero during this period. In 2023, while the number of patent filings decreased from the previous year's peak, it remained high at 108, reflecting sustained activity in patent filings. Copyright filings, however, did not show any activity, remaining at zero. Overall, the chart highlights a robust

increase in patent filings over the four years, particularly in 2022, while copyright filings remained extremely low throughout the period. This trend suggests a growing emphasis on securing patents, possibly due to increased innovation, research and development activities, and strategic protection of intellectual properties.

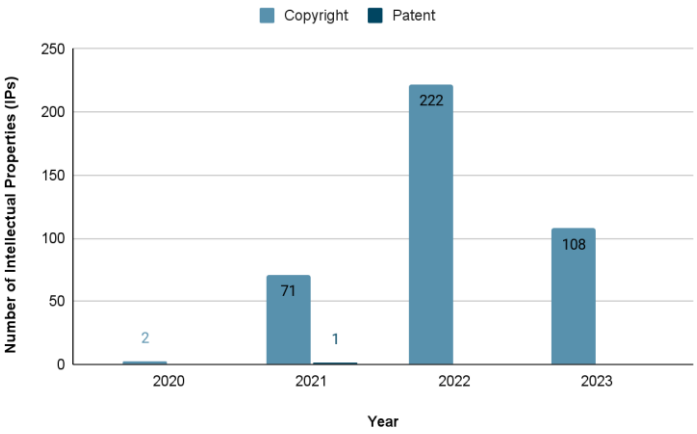


Figure 2.8 Number of Intellectual Properties (IPs)

Applied Technology by Community

Over the last five years, there has been a surge in technological development aimed at benefiting local communities, as shown in Figure 2.9. This growth is evident in the rising number of scientific articles published in national journals and the increasing number of research-based technologies adopted by these communities. In 2024, this number is expected to increase even further, as one of the mandatory outputs of internal funding is applied technology.

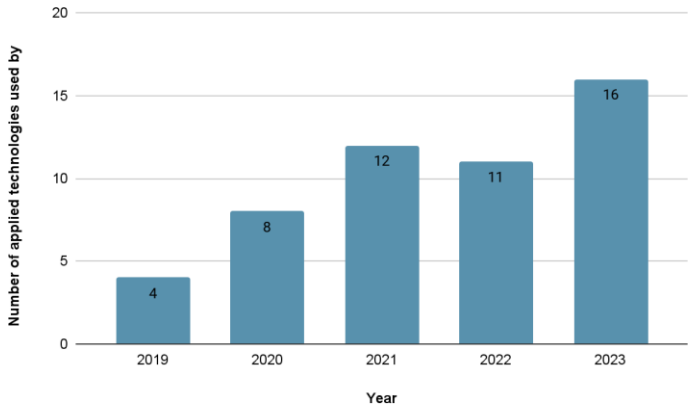


Figure 2.9 Number of applied technologies used by communities

2.1.2 Existing Partnerships and Collaborations

ITK has established partnerships with over 400 institutions across various sectors and at different levels, including local, national, and international. ITK's extensive and growing partnerships across various levels and sectors illustrate its proactive engagement and strategic initiatives to enhance its educational and research impact. These collaborations are pivotal in driving ITK's mission to contribute to technological and societal advancements. ITK has seen a significant increase in its collaborations with various institutions from 2014 to 2023. The bar chart in Figure 2.6, displaying the total number of partnerships per year, highlights a remarkable growth trajectory. Starting with a single partnership in 2014, the number steadily increased, with notable jumps in 2019 (98 partnerships) and 2020 (157 partnerships). The growth continued sharply, reaching 248 in 2021, 364 in 2022, and peaking at 415 in 2023. This upward trend underscores ITK's expanding network and commitment to fostering collaborations.

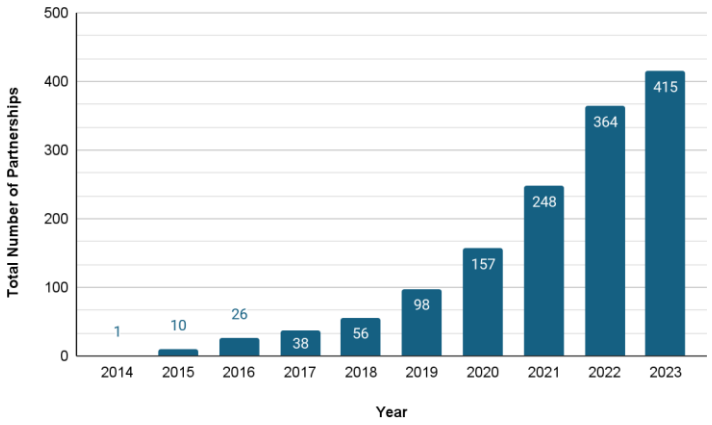


Figure 2.10 Accumulated number of partnerships of ITK with various institutions

The pie chart in Figure 2.7 further breaks down the nature of these partnerships by their geographic levels. Most partnerships are national, accounting for 72.4% of the total. Local partnerships (at the provincial level) represent 21.6%, while international collaborations make up 6%. This distribution indicates ITK's strong focus on national alliances, although there is also a significant engagement at the local level and an emerging presence in the international arena. As shown in Figure 2.8, the bar chart categorizing partnerships by sector provides additional insight into ITK's collaborative landscape. The government sector leads with 140 partnerships, followed by higher education institutions with 128 collaborations. This dominance reflects ITK's strategic alignment with governmental bodies and educational institutions to enhance its academic and research capabilities. Global tech companies form the next significant group with 37 partnerships, demonstrating ITK's connection with the technological industry. Other notable sectors include research institutions (32 partnerships), national companies (29 partnerships), multilateral institutions (18 partnerships), and social communities (9 partnerships). This diverse range of sectors showcases ITK's comprehensive approach to building a robust and multifaceted collaborative network.

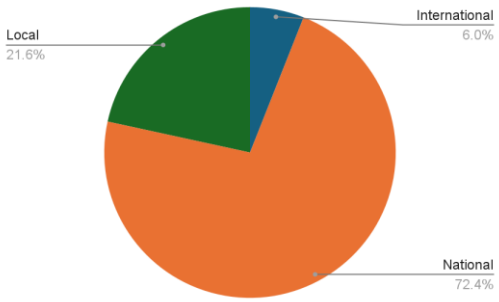


Figure 2.11 Percentage of partnerships based on the institutional levels

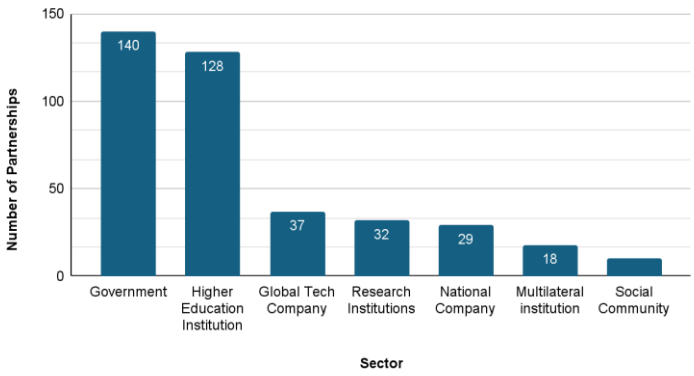


Figure 2.12 Number of partnerships based on the sector

Among ITK's international collaborations, there are notable partnerships with higher education institutions in Japan. Four of the 128 higher education institutions partnered with ITK are from Japan, listed below. The cooperation is mainly academic and research collaborations, aligning with ITK's visions to enhance its academic and research capabilities. The details of the cooperation can be seen in Table 2.1.

Table 2.1 Collaborations between ITK and four higher education institutions in Japan

Institutions	Collaborations	Details
The Faculty of Science and Engineering, Saga University	Academic Cooperation and Exchange	1. Exchange of academic staff members 2. Establishment of joint research programmes 3. Establishment of joint supervision of students 4. Exchange of scientific and educational literature, material, and topical research 5. Organization of conferences, seminars, and symposia
Laboratory of Diamond Electrochemistry, Keio University	Research Collaborations	1. Exchange of academic staff members for research purposes and experiment activity 2. Joint publications 3. Joint conferences, seminars, and symposia
University of Tsukuba	Academic Exchanges	1. Exchange of professors and researchers 2. Exchange of undergraduate and/or graduate students 3. Collaborative research and joint academic meetings 4. Exchange of information, publication, and materials for academic purposes
Tokyo University of Science	Academic Cooperation	1. Exchange of faculty members 2. Exchange of students 3. Joint research and conferences 4. Exchange of academic information and publications

2.1.3 Financial Status

The financial status of the institution from 2019 to 2023, as depicted in the tables, shows a significant growth in revenue and expenditure. As seen in Table 2.2, the Non-Tax State Revenue (PNBP) has consistently increased, particularly in educational revenue, which saw a notable rise from IDR 17,493,900,000 in 2019 to IDR 50,605,000,000 in 2023. Supporting and other revenue also contributed to this growth, with substantial yearly increments. The Management Support (RM), although initially negligible, saw significant allocations starting in 2021, particularly in the PHDN and BOPTN categories, reaching a total of IDR 35,406,164,000 in 2023.

Table 2.2 Revenue of ITK within 2019 - 2023 (in IDR)

Revenue Types	2019		2020		2021		2022		2023	
	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization
Non-Tax State Revenue (PNBP)										
Educational Revenue	17,493,900,000	23,063,813,000	18,368,500,000	24,692,371,049	20,445,400,000	27,343,678,951	31,744,416,000	30,910,724,293	50,605,000,000	38,342,225,101
Supporting Revenue	0	49,000,000	0	112,580,442	0	102,200,000	0	199,721,000	0	389,809,489
Other Revenue	0	0	0	130,816,933	0	46,178,987	0	159,149,661	0	890,106,280
Total PNBP	**17,493,900,000**	**23,112,813,000**	**18,368,500,000**	**24,935,768,424**	**20,445,400,000**	**27,492,057,938**	**31,744,416,000**	**31,269,594,954**	**50,605,000,000**	**39,622,140,870**
Management Support (RM)										
RM (Excluding Grants or BOPTN)	0		0		11,557,046,000		17,656,412,000		20,570,002,000	
PHLN	0		0		0		0		0	
PHDN	0		0		2,000,000,000		8,000,000,000		0	
BOPTN	0		6,046,664,000		8,496,444,000		9,496,444,000		14,836,162,000	
Total RM	**0**		**6,046,664,000**		**22,053,490,000**		**35,152,856,000**		**35,406,164,000**	
Total PNBP & RM	**17,493,900,000**		**24,415,146,000**		**42,498,890,000**		**66,897,272,000**		**86,011,164,000**	

*Educational Revenue : pendapatan ujian/seleksi masuk pendidikan, biaya pendidikan, dan pendidikan lainnya.
*Supporting Revenue : pendapatan pengelolaan BMN.
*Other Revenue : pendapatan uji lab, UPT Bahasa, dan lainnya

On the expenditure side, as detailed in Table 2.3, both PNBP and APBN (State Budget) expenditures increased correspondingly. Goods and capital expenditures under PNBP saw consistent growth, with total PNBP expenditures reaching IDR 38,641,462,185 in 2023. APBN expenditures, including employee, goods, and capital expenditures, also rose steadily, reflecting

increased investment in resources and infrastructure. The total combined PNBP and APBN expenditure peaked at IDR 71,351,396,825 in 2023. This financial trend indicates a robust growth in revenue generation and investment in institutional development, highlighting the institution's expanding financial base and commitment to enhancing its operational and infrastructural capacities.

Table 2.3 Expenditure of ITK within 2019 - 2023 (in IDR)

Expenditure Types	2019		2020		2021		2022		2023	
	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization
PNBP Expenditure										
Goods Expenditure	14,063,543,000	13,697,080,891	17,810,027,000	15,598,775,067	23,753,818,000	18,848,285,175	28,165,273,000	27,861,594,905	45,331,669,000	34,196,566,140
Capital Expenditure	8,410,580,000	8,208,489,943	5,828,871,000	5,021,225,688	6,901,703,000	4,669,133,287	3,261,698,000	3,256,034,598	4,767,281,000	2,444,896,049
Total PNBP Expenditure	**22,474,123,000**	**21,905,570,834**	**23,638,898,000**	**20,620,000,755**	**30,655,521,000**	**23,517,418,462**	**31,426,971,000**	**31,117,629,503**	**50,098,950,000**	**36,641,462,189**
State Budget (APBN) (RM)										
Employee Expenditure	3,595,592,000	3,169,290,244	7,216,620,000	5,424,153,779	8,216,546,000	7,814,394,809	14,315,912,000	12,273,356,628	16,131,952,000	15,786,024,597
Goods Expenditure	9,189,855,000	9,032,465,407	8,429,536,000	7,880,649,544	19,216,844,000	18,039,953,905	16,673,289,000	16,561,349,761	18,839,108,000	17,505,256,380
Capital Expenditure	1,335,800,000	1,149,905,600	1,217,128,000	1,197,492,380	6,712,100,000	6,402,356,949	2,636,127,000	2,529,512,174	1,921,124,000	1,699,253,797
Total APBN Expenditure	**14,121,247,000**	**13,351,661,251**	**16,863,284,000**	**14,502,295,703**	**34,145,490,000**	**32,256,705,663**	**33,625,328,000**	**31,364,218,563**	**36,892,184,000**	**34,990,534,774**
Total PNBP & APBN Expenditure	**36,595,370,000**	**35,257,187,085**	**40,502,182,000**	**35,122,296,458**	**64,801,011,000**	**55,774,124,125**	**65,052,299,000**	**62,481,848,066**	**86,991,134,000**	**71,631,996,963**

*PNBP: Pendapatan Negara Bukan Pajak (Non-Tax State Revenue)
*RM: Rencana Manajemen (Management Support)
*PHLN: Pinjaman Hibah Luar Negeri (Foreign Loans)
*PHDN: Pinjaman Hibah Dalam Negeri (Domestic Loans)
*BOPTN: Bantuan Operasional Perguruan Tinggi Negeri (Operational Assistance for State Universities)

Table 2.4 Funding from grants (in IDR)

Jenis Pendanaan	2019		2020		2021		2022		2023	
	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization	Budget Target	Budget Realization
SBSN	0	0	98,462,934,000	98,461,758,510	0	0	0	0	141,220,000,000	132,551,004,043
Penghargaan IKU	0	0	0	0	14,092,000,000		4,804,000,000		3,538,000,000	
Matching Fund	0	0	0	0	0		738,477,000		512,627,000	
PKKM	0	0	0	0	0		929,995,000		1,486,020,000	
Total Funding	0	0	**98,462,934,000**	**98,461,758,510**	**14,092,000,000**		**6,472,472,000**		**146,756,647,000**	

*SBSN: Surat Berharga Syariah Negara (State Sharia Securities)
*IKU: Indikator Kinerja Utama (Main Performance Indicator)
*Matching Fund: a funding initiative from the Ministry of Education, Culture, Research, and Technology aimed at facilitating the synergy *between higher education institutions and the commercialization of industry partners
*PKKM: Program Kompetisi Kampus Merdeka (Independent Campus Competition Program)

Table 2.4 displays the funding from grants from 2019 to 2023, highlighting significant growth, particularly in 2023. State Sharia Securities (SBSN) and the Main Performance Indicator Awards (IKU) have been the major funding sources. In 2020, SBSN funding was IDR 98.46 billion; in 2021, IKU funding reached IDR 14.09 billion. In 2023, SBSN funding surged to IDR 141.22 billion, realising IDR 132.55 billion. The Matching Fund program, which facilitates collaboration between higher education institutions and industry partners, was introduced in 2022 with IDR 738.47 million and increased to IDR 2.39 billion in 2023. The total funding across all programs has shown significant growth, with 2023 seeing the highest budget target and realizing IDR 146.76 billion, indicating effective financial planning and utilization of grant resources to support institutional initiatives.

Table 2.5 displays the fixed assets of the institution from 2019 to 2023. It includes various categories such as land, equipment and machinery, buildings and structures, roads and bridges, networks, other fixed assets, construction in progress (CIP), and software. The total value of fixed assets has shown significant growth over the years, indicating continuous investment in

infrastructure and assets. Notably, the total fixed assets value increased from IDR 203,611,891,260 in 2019 to IDR 519,496,952,514 in 2023, reflecting a substantial enhancement in the institution's asset base.

Table 2.5 Fixed assets of ITK within 2019 - 2023 (in IDR)

Fixed Asset	Year				
	2019	2020	2021	2022	2023
Land	52,257,350,432	52,257,350,432	55,974,473,239	57,466,614,503	57,466,614,503
Equipment and Machinery	17,586,363,351	50,271,749,084	58,281,031,997	61,005,320,847	118,336,420,065
Buildings and Structures	107,543,733,895	276,189,727,895	250,032,530,807	250,874,035,928	252,041,088,152
Roads and Bridges	0	1,359,206,800	4,462,857,171	4,462,857,171	11,465,485,218
Networks	661,247,300	2,544,414,700	2,731,414,700	2,731,414,700	2,731,414,700
Other Fixed Assets	788,993,000	987,836,850	1,293,486,850	1,530,643,789	1,730,540,789
Construction in Progress (CIP)	24,681,528,757	80,097,307,357	15,772,849,166	19,957,922,616	74,406,644,022
Software	92,674,525	681,060,565	870,260,565	1,009,343,565	1,318,745,065
Total Fixed Assets	**203,611,891,260**	**464,388,653,683**	**389,418,904,495**	**Rp399,038,153,119**	**519,496,952,514**

2.2 Necessity of the Project

Kalimantan currently lacks a Science Techno Park (STP). The region's economy is predominantly based on exploring natural resources (SDA), with a limited focus on technology-driven industries. Establishing the first STP in Kalimantan is essential to shift the economic base towards technology and innovation, which can provide more sustainable and diversified economic growth. Here are the key reasons why this project is necessary:

- **Economic Diversification**: Kalimantan's current economic activities heavily rely on natural resource extraction. This dependency poses significant risks due to fluctuating global commodity prices and environmental concerns. Establishing an STP will promote technological innovation, leading to the development of new industries and reducing reliance on natural resources.
- **Leveraging ITK's Capabilities**: ITK, as the only state technology institute in Kalimantan, has the necessary human resources, infrastructure, and partnerships to support the development of an STP. ITK's expertise in various technological fields makes it the ideal institution to spearhead this initiative. The development of an STP at ITK will facilitate the commercialization and downstream processing of scientific and technological products, enhancing the region's technological capabilities and economic resilience.
- **Strategic Location**: ITK is strategically located near Indonesia's new capital city (IKN) and industrial areas. This proximity offers a unique advantage for supporting national development plans and creating a hub for pentahelix collaboration, which involves academia, industry, government, community, and media. This model is crucial for fostering innovation, facilitating technology transfer, and driving economic growth in the region.
- **Addressing Regional Challenges**: Kalimantan faces several challenges, including the need for increased technological innovation, better utilization of research outputs, and stronger industry-academia collaborations. Establishing an STP at ITK will provide a dedicated space for research and development, incubation, and commercialization activities, thereby enhancing the region's capacity to produce high-value products and services. This, in turn, will attract more investments, create job opportunities, and promote sustainable economic development.
- **Supporting National Agenda**: Establishing the STP will align with the national agenda of technological advancement and self-reliance. It will provide a platform for local startups and entrepreneurs to develop and scale their innovations, contributing to the overall competitiveness of Indonesia's technology sector. This project will not only benefit Kalimantan but also support broader national goals of economic diversification and technological advancement.

- **Enhancing Educational Outcomes**: The presence of an STP at ITK will provide students and academic staff with real-world opportunities to apply their knowledge and skills. It will foster a culture of innovation and entrepreneurship within the university, enhancing educational outcomes and preparing graduates for the challenges of the modern economy.
- **Environmental Sustainability**: The STP can contribute to more sustainable economic practices by promoting technology-based industries. Innovations in renewable energy, waste management, and sustainable agriculture can be developed and implemented, helping to mitigate the environmental impact of traditional resource extraction industries.

2.2.1 Long-term Vision for ITK STP

ITK has 4 research centers that serve as the foundation for its lecturers' research activities. The research conducted is diverse, spanning Technology Readiness Levels 2-6. Prototypes and products have emerged as flagship outputs from these research focuses, accommodated by the Intergrated Laboratory 1. Several research activities carried out by groups of lecturers will subsequently be initiated into Centers of Excellence in Science and Technology (Pusat Unggulan IPTEK, CoEs). These CoEs will have specific products and technology derived from the research centers' research roadmap within ITK's Institute for Research and Community Service.

The establishment of CoEs of ITK is directed to develop innovation of research findings regarding products. Such advancement will support the university's autonomy and flexibility to income escalation, which aligns with the vision of ITK as PTN BLU. The CoEs' involvement in national competitive grants was initiated in 2024, especially through the Ministry of Education, Culture, Research and Technology. This process is being prepared by employing a more research facility in the Integrated Laboratory 2.

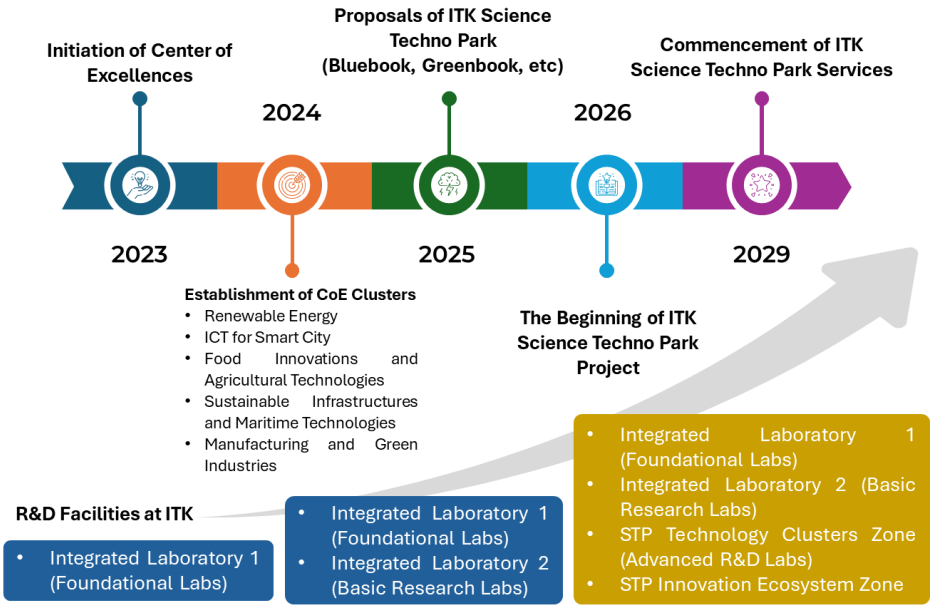


Figure 2.13 The transformation phase of Centers of Excellence to Science Techno Park and the R&D facilities at ITK

Figure 2.13 illustrates the phased development of the ITK from Centers of Excellence (CoE) to a fully operational Science Techno Park (STP) between 2023 and 2027. The transformation begins with the initiation of CoEs focusing on key areas like renewable energy, smart city technologies, and sustainable infrastructures. By 2024, these CoEs will be further established, laying the groundwork for the next phase. From 2024 to 2025, the proposal developments for the STP begin, followed by the STP's project construction from 2026 to 2028. By 2029, the STP will be fully operational, featuring foundational and basic research labs, advanced R&D labs, and an

innovation ecosystem zone. This strategic development aims to create a comprehensive environment for research, innovation, and technological advancement at ITK.

Collaboration with industry and government will be initiated to establish an STP by the direction of the PUI and the research centers. Research initially conducted at the laboratory stage will advance further with more sophisticated facilities and equipment in Integrated Laboratory 2 and advanced R&D labs in STP. ITK and companies will collaborate on research projects to develop technology products to provide students with practical experience. Therefore, besides focusing on product development to reach commercialization, students can contribute to and gain knowledge from ITK's centers of excellence. Further progress of the ITK STP will be the collaboration with several relevant companies in the manufacturing industry, ICT, energy, infrastructure and maritime, and food industries. Meanwhile, government funding in terms of Technopark will be an opportunity to improve the basis of human resources, infrastructure, and the possibility of expansion for the community.

The establishment of a successful STP involves close collaboration between academia, industry, and government and will leverage the strengths of each entity to drive innovation and commercialization. Once this collaborative ecosystem is thriving, the research stemming from ITK's centers of excellence will transition seamlessly from laboratory prototypes to market-ready products. These products, representing the culmination of advanced research and real-world application, will become flagship outputs of the Science Techno Park, primed for commercialization and broader societal benefit.

Vision of STP

As part of the development of the ITK as a higher education institution specializing in technology with the goal of developing and producing innovations, the vision of the Science Techno Park (STP) as "Hub for Technological Excellence", is: **"To be the premier hub of technology-driven innovations in Kalimantan, enhancing sustainable regional development and strengthening Indonesia's global competitiveness by 2035"**. By adhering to this vision, Science Techno Park aims to not only excel in the realm of technology and innovation but also to play a pivotal role in the sustainable development and prosperity of the Kalimantan region.

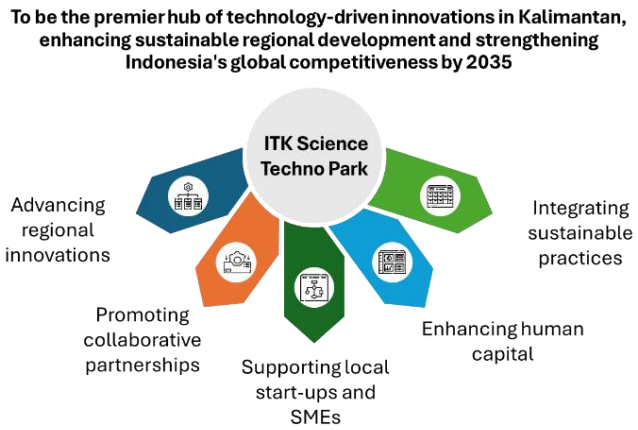


Figure 2.14 The vision of ITK STP

Missions of ITK STP:

1. Advancing regional innovations: Create an environment that supports research and development, fostering innovation specifically tailored to Kalimantan's unique resources and needs to address local challenges.
2. Promoting collaborative partnerships: Build strong relationships between ITK, local industries, government bodies, and international entities to accelerate technological advancements and their practical applications, facilitating technology transfer and commercialization.

3. Supporting local start-ups and SMEs: Provide state-of-the-art infrastructure, resources, and mentorship programs to support the growth and sustainability of local start-ups and SMEs, focusing on high-tech and sustainable solutions.
4. Enhancing human capital: Develop a skilled workforce through education and training programs at ITK, promoting the adoption of advanced technologies and enhancing regional and national competitiveness.
5. Integrating sustainable practices: Emphasize sustainable development by integrating green technologies and practices in all operations, contributing to environmental preservation and the sustainable use of regional resources.

2.2.2 Strategy of ITK STP Model

The Science Techno Park (STP) model at Institut Teknologi Kalimantan (ITK) serves as a comprehensive framework to foster innovation and entrepreneurship by integrating research and academic contributions with external partnerships and human resources. This model, as illustrated in Figure 2.15 bridges the gap between academia and industry, ensuring the practical application and commercialization of innovative ideas and technologies.

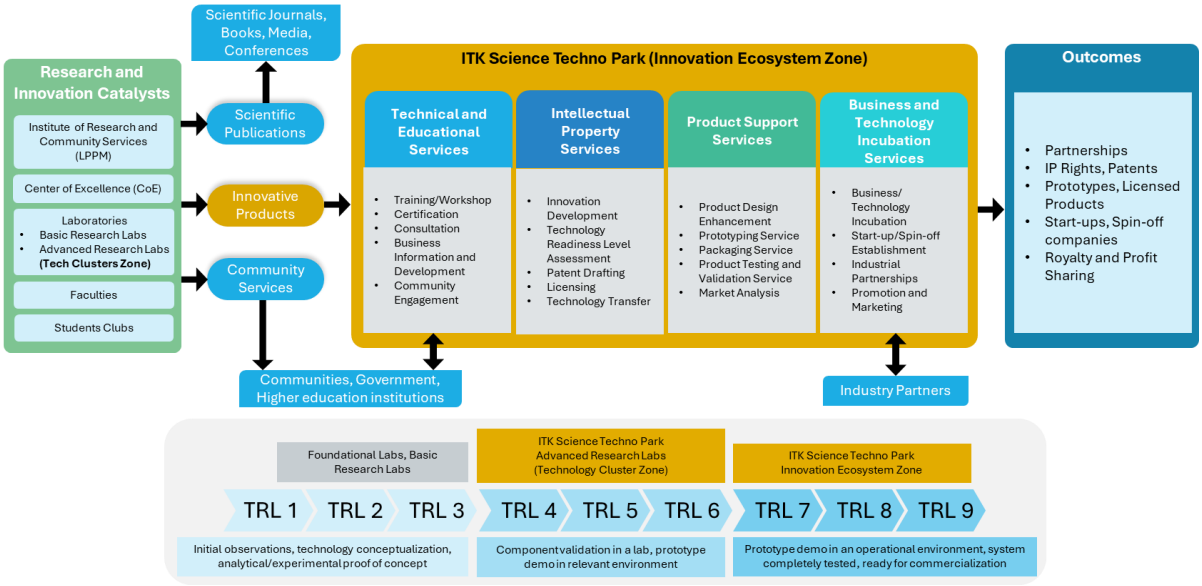


Figure 2.15 ITK STP model and key activities

The ITK STP model also emphasizes the role of research and innovation catalysts, such as the Institute of Research and Community Services (LPPM), Center of Excellence (CoE), laboratories, faculties, and student clubs. These entities contribute significantly to generating innovative products and scientific publications, enhancing the STP's offerings. External stakeholders, including industry partners, government, and higher education institutions, play a vital role in supporting and applying the technologies developed within the STP. Their involvement ensures that innovations are market-ready and meet regulatory standards, facilitating their scaling and commercialization. Human resources, including students, lecturers, and academic staff, are crucial to the STP's success. Their engagement in various STP activities fosters a culture of innovation and collaboration, driving the continuous growth of knowledge and skills within the community.

The outcomes of the ITK STP model include partnerships, IP rights, patents, prototypes, licensed products, start-ups, spin-off companies, and opportunities for royalty and profit sharing. This dynamic framework leverages academic research, external partnerships, and human resources to provide a comprehensive suite of services, promoting technological advancement and economic development.

2.2.2.1 Technical and Educational Services

Technical and educational services are a crucial component of the ITK Science Techno Park, directly connecting academic research with industry needs and community engagement. These services are designed to help turn innovative research into practical applications, creating an environment where technology and knowledge can grow. By offering targeted training, expert consulting, and business development support, the ITK Science Techno Park ensures that both individuals and organizations have the skills, knowledge, and resources needed to succeed in the fast-changing world of technology. These services not only improve technical abilities but also empower participants to play a key role in regional and national innovation efforts. Activities in this service division are as follows:

1. Training Workshops and Certification

ITK STP organizes specialized training workshops that focus on specific technological areas, providing participants with practical experience and up-to-date knowledge. These workshops cover a wide range of topics, from basic technical skills to advanced research methods, with an emphasis on applying what is learned in real-world situations. Certification programs add value by offering industry-recognized credentials and enhancing employability and career growth.

2. Consulting Services

ITK STP brings together experts in science and technology to provide consulting services that meet the needs of startups, established companies, and research organizations. These services cover a broad range, including business strategy, market analysis, innovation management, and technical problem-solving. By tapping into this expertise, clients can improve their operations, overcome challenges, and speed up the development of new products or services, driving growth and innovation.

3. Business Information and Development

This service supports businesses at various stages, offering important insights and strategies for growth. ITK Science Techno Park helps with business plan creation, consumer insights, and innovation management, ensuring that companies are prepared to grow and compete in their markets. By providing this support, the park plays a key role in enhancing business strength and fostering sustainable growth.

4. Community Engagement

The STP actively engages with the local community by offering educational programs, workshops, and events that increase awareness of technological advancements. These efforts are aimed at inspiring and involving the community, especially the younger generation, to create a culture of innovation and collaboration. Through these activities, the park not only promotes technology awareness but also strengthens the connections between academia, industry, and society.

2.2.2.2 Intellectual Property Services

Intellectual Property Services are essential for fostering innovation and enabling the commercialization of research within the ITK STP. These services include a range of activities such as innovation development, patent drafting, licensing, and technology transfer. The main objective is to protect intellectual property (IP) rights while strategically leveraging them to maximize their impact.

1. Innovation Development

The ITK STP plays a crucial role in advancing technologies from early-stage research to more applied and commercially viable products. These development programs focus on refining innovations, transforming initial concepts into patentable inventions, scaling them for commercial production, and ensuring they are ready for the market.

2. Patent Drafting

Patent drafting at the ITK STP involves providing detailed assistance in creating comprehensive and legally robust patent applications. This service ensures that all unique and innovative aspects of an invention are clearly defined and protected under applicable patent laws. The process also includes helping inventors navigate the complexities of both national and international patent regulations, ensuring that their inventions are properly secured and that their IP rights are thoroughly safeguarded.

3. Licensing

Licensing services at the ITK STP are designed to facilitate the process of granting permission for third parties to use patented technologies. This involves structuring financial arrangements, such as royalty agreements, to generate revenue from licensed technologies. The STP ensures that inventors and researchers benefit financially from their innovations while also enabling broader access to their technologies. By managing and negotiating licensing agreements, the STP helps inventors extend the reach of their innovations and maximize their commercial impact.

4. Technology Transfer

Technology transfer services at the ITK STP are aimed at bridging the gap between research institutions and the commercial industry. These services focus on moving innovative technologies from the laboratory to the marketplace, ensuring that they can be scaled up for mass production and widespread use. The STP actively engages with industry partners to identify collaboration opportunities, facilitating the adoption of new technologies by businesses. Through these efforts, the STP not only promotes the commercialization of academic research but also contributes to regional and national economic development.

2.2.2.3 Product Support Services

Product Support Services at the ITK STP are designed to help innovators and entrepreneurs transform their ideas into market-ready products. These services provide comprehensive support throughout the product development lifecycle, ensuring that innovations are not only technically sound but also commercially viable.

1. Product Design Enhancement

This service provides expert guidance and technical assistance to refine the design and functionality of products. Collaborating closely with designers and engineers, the ITK STP helps enhance product features, aesthetics, and usability. The goal is to ensure that products are innovative, user-centric, and meet both industry standards and market demands.

2. Prototyping

The prototyping service offers access to cutting-edge facilities and equipment for creating physical prototypes. By supporting rapid prototyping, the ITK STP enables quick iteration and refinement of product concepts, allowing innovators to test and assess the feasibility of their designs before moving to full-scale production. This iterative process is crucial for identifying potential improvements and ensuring that the final product is well-optimized.

3. Testing and Validation

Rigorous testing and validation are critical components of the product development process at the ITK STP. This service conducts thorough testing of prototypes to ensure they meet stringent safety, quality, and performance standards. Additionally, the validation process certifies that products comply with regulatory requirements and industry norms, providing confidence to both developers and potential investors that the product is ready for market entry.

4. Market Analysis and Packaging

To ensure that products are positioned for success, the ITK STP offers comprehensive market analysis and packaging services. This includes analyzing market trends, consumer preferences, and competitive landscapes to develop effective positioning strategies. The service also provides

guidance on packaging design, ensuring that it not only appeals to consumers but also aligns with the product's brand and market positioning. Insights into pricing strategies and potential market entry points are also provided, helping innovators make informed decisions that enhance their product's market potential.

2.2.2.4 Business and Technology Incubation Services

Business and Technology Incubation Services at the ITK STP provide essential support to transform innovative ideas into thriving business ventures. These services offer a comprehensive incubation process, encompassing business incubation, start-up and spin-off support, and promotion and marketing assistance, to help entrepreneurs scale their businesses successfully.

1. Business Incubation

The ITK STP offers a supportive ecosystem where entrepreneurs can nurture their business ideas in a low-risk environment. This service provides access to office space, shared facilities, and essential resources, significantly reducing startup overhead costs. Entrepreneurs also benefit from valuable networking opportunities with industry experts, investors, and fellow entrepreneurs. Additionally, the program offers mentorship and coaching from experienced business leaders, guiding entrepreneurs through the challenges of starting and growing a business.

2. Start-up and Spin-off Support

This service is dedicated to assisting in forming new companies and helping entrepreneurs take their concepts from the drawing board to the marketplace. The ITK STP guides legal and regulatory compliance, including company registration, intellectual property rights, and contract negotiations. Furthermore, the program supports the scaling of businesses by offering strategies for growth, market entry plans, and advice on expanding operations both domestically and internationally.

3. Promotion and Marketing Assistance

Effective promotion and marketing are crucial for the success of any startup. The ITK STP assists startups in creating strong brand identities and marketing their products or services to the right audiences. This service helps build partnerships and alliances with established businesses, enhancing the visibility and credibility of startups. Additionally, the program supports the creation of promotional materials, such as brochures, websites, and social media content, to attract attention and drive business growth.

4. Technology Development and Commercialization

The ITK STP offers startups access to advanced technology and research facilities to develop and refine their products or services. This service supports the commercialization process by helping startups navigate the complexities of bringing new technologies to market, including obtaining regulatory approvals, crafting market entry strategies, and establishing distribution channels. By providing these resources and expertise, the ITK STP helps ensure that innovative technologies reach the market successfully.

2.2.3 Target Industries and Technology Clusters

The distribution of large and medium versus micro and small manufacturing establishments across various industrial classifications in East Kalimantan for the year 2020 is shown in Table 2.6. The largest number of establishments is found in the manufacture of food products, with 39 large and medium units and 10,327 micro and small units. Other significant sectors include the manufacture of wearing apparel, wood products, and fabricated metal products. The data highlights the diverse industrial landscape of East Kalimantan, with a notable presence of both large-scale and small-scale manufacturing activities. This diversity in industrial activity indicates

potential areas for growth and development, as well as the importance of supporting both ends of the manufacturing spectrum to stimulate economic advancement in the region.

Table 2.6 Industry classification in East Kalimantan

Industrial Classification	Number of Establishment (Unit)	
	Large and Medium Manufacturing	Micro and Small Manufacturing
Manufacture of food products	39	10327
Manufacture of beverages	6	3103
Manufacture of wearing apparel	3	2838
Manufacture of wood and of products of wood and cork, of articles of straw and plaiting materials	1	1595
Printing and reproduction of recorded media	4	611
Manufacture of coke and refined petroleum products, manufacture of chemicals and chemical products	5	0
Manufacture of rubber and plastic products	3	40
Manufacture of other non-metallic mineral products	6	1216
Manufacture of fabricated metal products, manufacture of motor vehicles, trailers and semi-trailers	4	1142
Manufacture of other transport equipment, manufacture of furniture	4	956
Repair and installation of machinery and equipment	19	41
Manufacture of textiles	0	950
Manufacture of leather and related products	0	23
Manufacture of paper and paper products	0	12
Manufacture of chemicals and chemical products	0	91
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0	49
Manufacture of computer, electronic and optical products	0	18
Manufacture of electrical equipment	0	90
Other manufacturing	0	1473
Total	**94**	**24575**

Source: Kaltim dalam Angka 2023

2.2.3.1 Cluster 1: Renewable Energy

The Renewable Energy Cluster at the Kalimantan Institute of Technology (ITK) plays a central role in developing research and renewable energy applications in Indonesia, especially in East Kalimantan. The Center for Intelligent Energy System Research and Engineering (CIESRE) was established to support the Renewable Energy Cluster to produce technology and application of intelligent energy systems that support the achievement of Sustainable Development Goal 7 (SDG7) for the provision of affordable clean energy for all levels of society. To realize this, CIESRE combines the concept of upstream-downstream energy utilization consisting of investigations of the feasibility of potential resources, appropriate technology, and analysis, monitoring and auditing of energy in the electric power system, which is strengthened by education involving elements of society, students, industry and lecturers. In accordance with the vision and mission of ITK to be able to help utilize regional resources, CIESRE specifically aims to overcome the challenges of technology, management and utilization of conventional energy as well as new and renewable energy (EBT) in the electric power system both for systems connected to the grid and for special small-scale and limited allocations. Concerning the surrounding conditions that already have existing plants that use conventional energy, both from the State Electricity Company (PLN) and non-PLN electricity, the innovation offered by CIESRE is not only to be able to produce solutions related to the provision of environmentally friendly electricity in various sectors but also to provide services to produce recommendations in the field of investigation of resource potential and energy assessments in existing plants. Since 2020, CIESRE has been actively conducting studies related to the feasibility of EBT potential, as well as research and application of energy systems related to the use of EBT for fishermen, remote villages and agriculture. CIESRE is expected to synergize and have a good impact to expand the application of affordable smart energy systems for the community.

In addition, the Renewable Energy Cluster is also supported by the Center for Fluid-Based Renewable Energy Studies and Engineering, which is a center of excellence for innovation with a focus on research and development of fluid-based renewable energy technologies, including wind energy and water energy. This center aims to optimize utilizing abundant natural resources in East Kalimantan by developing efficient and sustainable energy systems. In addition, this center also plays a role in supporting the development of the Indonesian Capital City (IKN) through environmentally friendly energy innovations and contributing to the achievement of the Sustainable Development Goals (SDGs). The research and development carried out includes design, performance analysis, and implementation of fluid-based energy technologies to ensure the availability of clean and affordable energy for the community. In addition, this research also supports the reduction of carbon emissions, which is in line with SDG 13 regarding actions to address climate change.

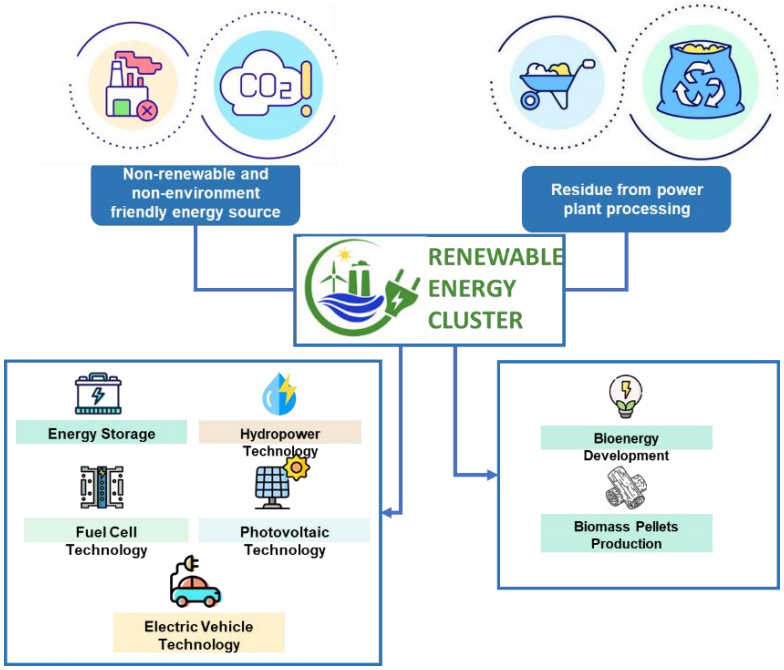


Figure 2.16 Illustration of Renewable Energy Cluster

The Renewable Energy Cluster is also engaged in materials engineering, studying various aspects of materials such as composition, structure, processing, and material characterization supported by the Center for Functional Materials Engineering and Energy Diversification. This knowledge is applied to develop materials suitable for specific properties and applications, including system performance analysis and material selection for energy systems. With a focus on developing functional materials engineering, this cluster encourages energy diversification through material innovation that can improve the efficiency and performance of renewable energy systems. This effort not only produces more sophisticated and sustainable energy solutions but also strengthens the energy infrastructure that supports the development of the Indonesian Capital City (IKN) as a modern and environmentally friendly city. The development of these innovative materials plays an important role in presenting more efficient and reliable renewable energy technologies, thereby accelerating the transition to clean energy use and supporting the achievement of the Sustainable Development Goals (SDGs).

In the short term, over the next five years, the Renewable Energy Cluster plans to increase collaboration with various stakeholders, both at the national and international levels. The goal is to accelerate the application of EBT technology in various sectors. In addition, this cluster will strengthen research capacity through improving laboratory facilities and human resource training. With the support of three Centers of Excellence in Innovation, namely the Center for Functional Materials Engineering and Energy Diversification, the Center for Intelligent Energy Systems Research and Engineering, and the Center for Fluid-Based Renewable Energy Studies

and Engineering, ITK is committed to becoming a center of excellence in the development and application of renewable energy in Indonesia.

Table 2.7 Regional issues and potential products offered by Renewable Energy Cluster

No	Issues	Proof (Supporting Data)	Potential Products
1	Domination of fossil energy source which degrades the environment, while lacking of utilization of renewable energy sources	• https://www.kompas.id/baca/nusantara/2023/09/26/kalimantan-timur-ikn-dan-tantangan-transmisi-energi https://diskominfomc.kalselprov.go.id/2024/06/03/tahun-2024-pemprov-kalsel-identifikasi-energi-baru-terbarukan/ • https://beritakaltim.co/2024/01/07/potensi-energi-terbarukan-di-kaltim-luar-biasa/ • https://www.hukumonline.com/berita/a/dari-potensi--isu--dan-regulasi-plts-fotovoltaik-di-indonesia-lt64777d086d172/	1. High-efficiency solar panels, inverter technology, and energy storage systems (batteries). 2. Wind turbines with advanced blade designs and efficiency optimization. 3. Biomass gasification, anaerobic digestion, and combined heat and power (CHP) systems. 4. Hybrid renewable energy systems and integration of generators with smart grid technology. 5. Advanced Battery Storage Systems including lithium-ion batteries, flow batteries, and other advanced energy storage technologies.
2	The large amount of forestry and palm oil plantation waste in Kalimantan requires biomass management to become a renewable energy source	• https://www.gapki-kalbar.or.id/blog.php?page=isi&id=213 • https://zonaebt.com/biomassa/peta-persebaran-limbah-biomassa-di-indonesia/ • https://www.ipress.instiperjogja.ac.id/storage/book/pdf/1676428059.pdf	1. Biomass pellets produced with pelletizing machines that compress biomass waste into dense, easy-to-transport pellets. 2. Biogas Plants with anaerobic digesters that break down organic matter in the absence of oxygen to produce biogas (mainly methane) and digestate.

The Renewable Energy Cluster collaborates with various industries to address energy challenges in Kalimantan. Collaboration with the palm oil industry such as PT Julong Group Indonesia utilizes biomass waste to produce renewable energy through biomass power plants and biogas from liquid waste (POME). The forestry industry such as Perhutani can convert wood waste into biomass and biochar for energy and increasing soil fertility. Energy companies such as PT PLN and PT Pertamina can install solar panels, develop smart grids, and optimize the use of renewable energy. The agricultural industry, including BISI International and PT Pertani, can utilize agricultural waste for biogas. The manufacturing industry such as PT Pindad can support the production of renewable energy equipment. In addition, the information technology industry such as Telkom Indonesia can assist in the development of smart grid and IoT solutions for energy management. This collaboration is expected to increase the use of renewable energy and reduce dependence on fossil fuels in Kalimantan.

2.2.3.2 Cluster 2: Information and Communication Technologies for Smart City

The ICT for Smart City Cluster (ICTSC) plays a pivotal role in enhancing local economies, upgrading infrastructure, and developing human resources, thereby addressing the urban-rural disparities prevalent in many regions. ICTSC's participatory research approach is integral to aligning solutions with community needs and aspirations, enabling these communities to actively contribute to and benefit from broader Smart City and Smart Regency initiatives, including those linked to the Nusantara project. ICTSC's efforts focus on fostering self-reliance and resilience in Indonesia, laying a robust foundation for the future growth and development of the new capital. By integrating artificial intelligence (AI) with the Internet of Things (IoT), ICTSC aims to transform East Kalimantan into a technologically advanced region. The center's work on real-time data analytics and machine learning, powered by IoT devices and sensors, is essential for addressing the complex challenges posed by rapid urbanization and the establishment of Nusantara. This integration of AI and IoT is expected to enhance decision-making processes, optimize resource management, and improve service delivery, supporting sustainable development goals (SDGs) for the new capital.

The ICTSC emphasizes preserving and promoting Indonesia's diverse cultural identity, especially east Kalimantan, and the influence of various migrant communities. This cultural richness offers a unique opportunity for creating vibrant and sustainable urban spaces. ICTSC blends scientific knowledge with local wisdom to create dynamic urban environments that foster creativity,

enhance the quality of life, and attract residents and tourists alike. This, in turn, contributes to the economic and social vitality of East Kalimantan.

Through collaboration of all centers, the ICTSC Center provides comprehensive solutions addressing the multifaceted challenges of East Kalimantan's and Indonesia's development. This includes a holistic approach to community empowerment, smart city technology, cultural preservation, disaster mitigation, and technological innovation. Such synergy enhances East Kalimantan's readiness to host the new national capital and supports sustainable regional development, positioning the region as a model for leveraging technology and local resources for sustainable and inclusive growth. Short-term aims for the next five years include:

- Real-time city management
- Predictive maintenance algorithms
- Local economic development platforms and smart village initiatives
- Geophysical sensor networks
- Enhanced digital preservation, remote access, virtual tourism, and educational augmented reality

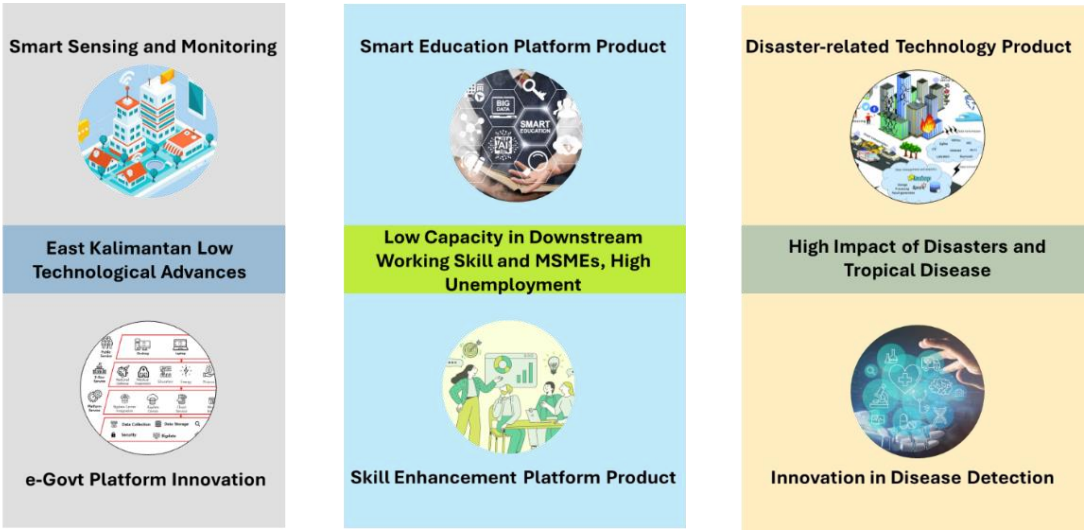


Figure 2.17 Illustration of ICT for Smart City Cluster

Table 2.8 Regional issues and potential products offered by the ICT for Smart City Cluster

No	Issues	Supporting Information	Potential Products
1	East Kalimantan has low technological advances while New Capital Nusantara needs of technology	• https://diskominfo.kaltimprov.go.id/pemerintahan/diskominfo-kaltim-gelar-rapat-pembahasan-indikator-pemantauan-dan-evaluasi-spbe-2024 • https://indonesiainteraktif.com/index.php/blank-spot-jaringan-telekomunikasi-sudah-diprogramkan-pada-tahun-2023-2024	1. **Smart sensing and monitoring products:** advanced sensors, IoT devices, and automated systems to monitor and control various objects, such as home, offices, industries, traffics, and infrastructures. 2. **e-Govt Platform Innovation:** Platforms that integrates various government departments and services, enabling citizens to access and complete governmental processes online efficiently.
2	High impact of disasters and tropical disease	• https://katalog.data.go.id/dataset/data-kerusakan-kawasan-akibat-bencana-provinsi-kaltim-tahun-2021 • https://katalog.data.go.id/dataset/data-frekuensi-terjadinya-bencana-di-provinsi-kalimantan-timur-tahun-2021/resource/bc7d3bd4-d162-4159-aa6e-bddadf1f5fbf • https://katalog.data.go.id/dataset/data-penyakit-tidak-menular-atau-degeneratif-provinsi-kaltim-tahun-2019-2021/resource/cf2abc3d-b8d3-4c68-9cf5-408f51d38079	1. **Disaster-related Technology Product:** The system continuously monitors environmental conditions such as weather patterns, seismic activity, and flood levels using a network of sensors. 2. **Innovation in Disease Detection Product:** The product employs a variety of sensors to monitor vital signs and detect early symptoms of diseases.
3	Low capacity in downstream working	• Balikpapan in number 2023	1. **Smart Education Platform Product:** Digital platforms that offers a wide range of courses and

	skill and MSMEs, high unemployment	• https://katalog.data.go.id/dataset/data-umkm/resource/122cf29c-53f9-4fb5-b80e-63375e541a02	training programs that emphasize technological proficiency and practical application. 2. **Skill Enhancement Platform Product:** The platform provides resources and tools for ideation, design, prototyping, and production.

The targeted companies and Regional Apparatus Organizations for the ICTSC in East Kalimantan can be categorized based on their roles in supporting and implementing smart city initiatives, including, but not limited to, information and technology companies (Telkom), AI and IoT startups, environmental and sustainable companies, transportation and logistics companies, provincial and local government offices, disaster mitigation agencies (BPBD and BMKG) and cultural tourism and education institution. With the rapid growth of technological advances in the New Capital City and Eastern Indonesia, ICTSC aims to become a center for ICT product development in the long term.

2.2.3.3 Cluster 3: Food Innovations and Agricultural Technologies

In East Kalimantan, the convergence of its agricultural landscape with its rich potential in commodities like pepper, durian, palm oil, and rubber seeds underscores a dynamic relationship between food production and the broader agricultural industry. Once a prominent crop, pepper has declined as farmers have shifted to palm oil cultivation, reducing its cultivated area to just 108 hectares. The exponential growth of oil palm plantations, which reached 256,000 hectares by 2023, has become a pivotal force in the region's agricultural economy, significantly shaping its landscape and economic outlook. Rubber plantations, spanning 92,000 hectares, primarily focus on latex production. However, the untapped potential of rubber seeds offers opportunities for further exploration and development.

These agricultural dynamics in East Kalimantan highlight the delicate balance between traditional crops, emerging commodities, and the evolving needs of global markets. East Kalimantan can leverage its agricultural diversity to drive economic growth while preserving its rich natural heritage by fostering innovation in processing, value addition, and sustainable farming practices. The industrial agriculture sector in Kalimantan plays a crucial role in the region's economy, capitalizing on its abundant natural resources and diverse agricultural commodities. Key aspects of the agricultural industry in Kalimantan include:

- **Palm Oil Production**: Kalimantan is a major hub for palm oil production in Indonesia. Vast plantations, particularly in East Kalimantan, are complemented by palm oil processing facilities that produce crude palm oil and refine it into various derivative products. These products are used globally in the food, cosmetics, and biofuels industries.
- **Rubber Plantations**: The region's rubber plantations produce natural rubber latex, a critical raw material for various industries, including automotive, medical, and consumer goods sectors. The industrial processing of rubber involves the extraction, processing, and exportation of latex and related products.
- **Pepper Production**: Despite the decline in pepper production due to the shift towards palm oil, the processing of spices remains an important industrial activity in Kalimantan. The remaining pepper processing facilities add value to locally grown spices before they are distributed to domestic and international markets.
- **Fruit Processing**: The processing of fruits such as durian, pineapple, banana, and dragon fruit is gaining traction in Kalimantan. Research and development efforts are focused on enhancing the value chain of these fruits, including by-product utilization and processing techniques to extend shelf life and increase export potential.

Overall, the industrial sector of agriculture in Kalimantan reflects a dynamic interplay between traditional crop cultivation and modern processing techniques. It sustains local livelihoods and contributes significantly to Indonesia's agricultural exports and economic growth.

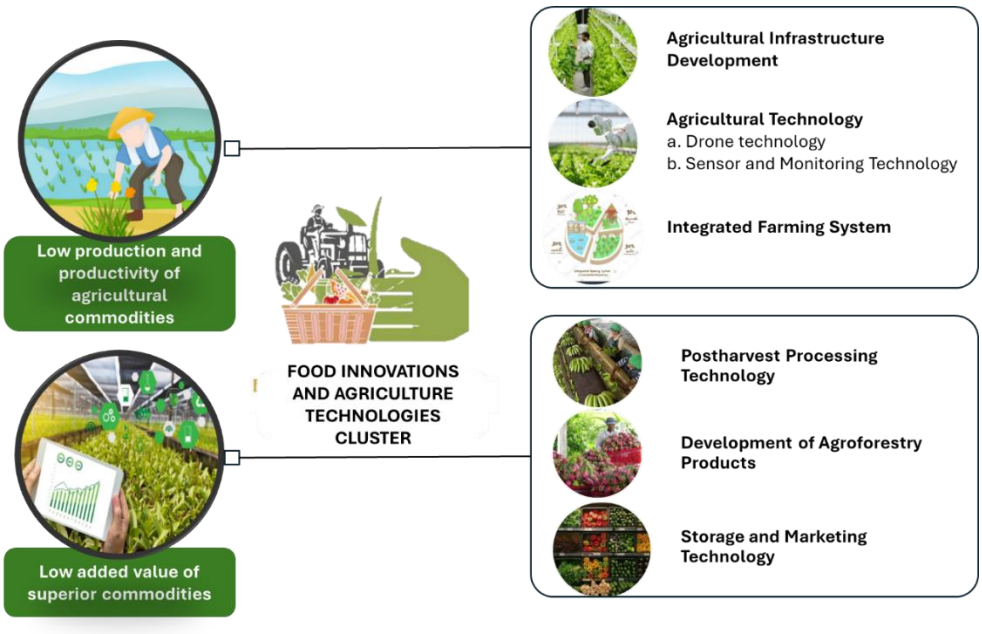


Figure 2.18 Illustration of Food Innovations and Agricultural Technologies Cluster

Table 2.9 Regional issues and potential products offered by the Food Innovations and Agricultural Technologies Cluster

No	Issues	Supporting Information	Potential Products
1	Low production and productivity of agricultural commodities	• https://diskominfo.kaltimprov.go.id/perkebunan/produksi-perkebunan-kaltim-capai-17-juta-ton-di-tahun-2022 • https://diskominfomc.kalselprov.go.id/2023/07/10/bangsibun-bakaret-inovasi-kalsel-gelorakan-kembali-industri-karet/ • https://distan.kalbarprov.go.id/node/98 • https://ppid-distan.kalbarprov.go.id/node/54	**Agricultural Infrastructure Development**: Investments in infrastructure such as good irrigation systems, road access, and electricity supply can improve farmers' access. **Agricultural Technology Enhancement**: Introducing modern technologies such as superior seed varieties, efficient irrigation systems, and the use of organic fertilizers or other appropriate fertilizers can improve agricultural productivity and quality. **Integrated Farming System**: Integrating various agricultural components (plants, livestock, and fisheries) to improve productivity and efficiency in the use of resources. **Drone Technology Use**: Utilizing drones for land mapping, monitoring plant growth, and identifying issues such as nutrient deficiencies or pest attacks quickly and efficiently. **Sensor and Monitoring Technology**: Using sensors to control soil moisture, soil pH, and nutrient needs in plants in real-time.
2	Low added value of superior commodities	• https://brida.kalselprov.go.id/analisis-pengembangan-komoditas-unggulan-daerah-kalimantan-selatan/ • https://disbun.kaltimprov.go.id/halaman/potensi-daerah-provinsi-kalimantan-timur • https://news.republika.co.id/berita/s3t7tf423/pemprov-kalsel-promosikan-tujuh-produk-unggulan-untuk-ekspor • https://kalteng.antaranews.com/berita/554205/komoditi-pertanian-kalteng-kian-diminati-di-pasar-ekspor • https://distan.kalbarprov.go.id/node/406	**Post-Harvest Processing Technology**: Using post-harvest machines like corn shellers, coffee huskers, or cocoa bean peelers can enhance the efficiency and quality of processed products. **Agroforestry Product Development**: Developing forest products, fruit trees, or high-quality timber can increase the added value of agricultural products. **Storage and Marketing Technology**: Using modern technology in storage such as controlled atmosphere storage can maintain the quality of agricultural products during transportation and storage.

Target industries of Food Innovations and Agricultural Technologies Cluster:

- **Food and Beverage Industry:** This industry can collaborate with the agricultural food cluster to develop processed food products from Kalimantan's superior agricultural commodities, such as processing cocoa into chocolate, processing coconuts into coconut oil, or processing fruits into juice or other packaged products.
- **Technology and Innovation Industry:** The technology industry can play a role in providing technological solutions, including the use of sensors, IoT (Internet of Things), and agricultural information systems for more efficient and sustainable agriculture monitoring and management.
- **Fertilizer and Agrochemical Industry:** Collaboration with the fertilizer and agrochemical industry can help develop organic fertilizers or specialized fertilizers suited to the soil conditions and types of crops in Kalimantan, as well as environmentally friendly agrochemical solutions.

2.2.3.4 Cluster 4: Sustainable Infrastructures and Maritime Technologies

In the Sustainable Infrastructures and Maritime Technologies cluster, the Center for Sustainable Creative City of Borneo (SCCB) collaborates with various industries in Kalimantan to support the development of sustainable creative cities. The Sustainable Infrastructure Lab partners with local construction companies to design and build environmentally friendly urban infrastructure, such as energy-efficient buildings and sustainable transportation systems. The Green Construction Room develops green construction techniques and materials used in residential and commercial projects. Additionally, the Interactive Heritage Technology Lab works with the tourism industry to create interactive tourist experiences using VR and AR technologies, promoting Borneo's cultural heritage.

The Maritime Infrastructure Engineering Center leverages collaborations with shipbuilding and shipping industries in Kalimantan to develop sustainable tourist vessels with green technologies. The Marine Systems Engineering Lab collaborates with shipyards to develop eco-friendly materials and hybrid or electric propulsion systems, creating more efficient and environmentally friendly ships. Shipping companies can operate these vessels to offer eco-friendly maritime tourism, attracting environmentally conscious tourists. This collaboration enhances the competitiveness of the maritime and tourism industries in Kalimantan while supporting environmental sustainability.

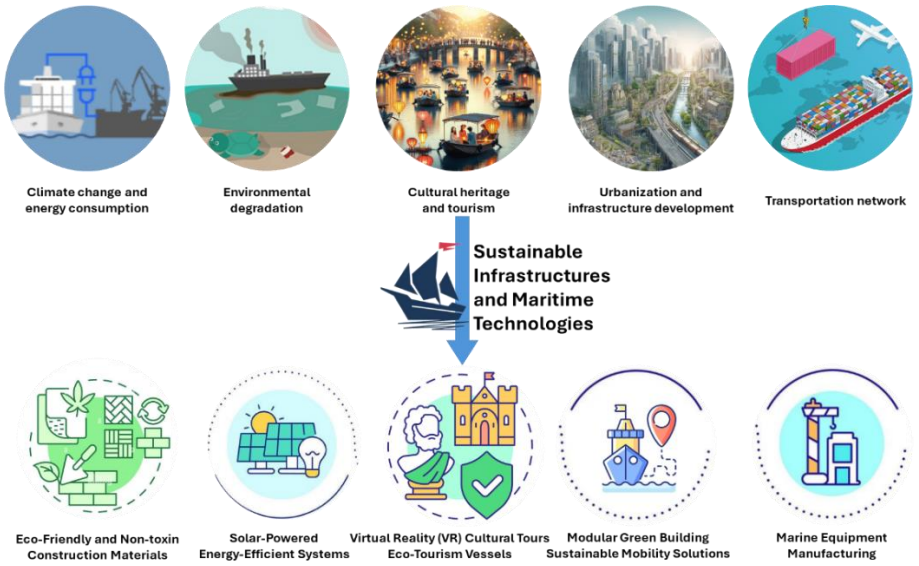


Figure 2.19 Illustration of Sustainable Infrastructures and Maritime Technologies Cluster

Meanwhile, the Marine Systems Emissions Control Research Center works with the fishing and shipping industries in Kalimantan to reduce emissions from ships. The Green Ship Production Lab focuses on developing and producing traditional fishing vessels powered by solar energy, biofuels, and pollution control systems in exhaust channels. The fishing industry can adopt this

technology to improve operational efficiency and reduce environmental impact, while the shipping industry can use these vessels for more environmentally friendly operations. This collaboration supports the reduction of greenhouse gas emissions from the maritime sector in Kalimantan and promotes the sustainability of the fishing and shipping industries.

Table 2.10 Relevant issues and potential products offered by Sustainable Infrastructures and Maritime Technologies Cluster

No	Issues	Supporting Information	Potential Products
1.	Environmental Degradation and Deforestation	According to data from Forest Watch Indonesia (FWI), Kalimantan lost approximately 29.5 million hectares of forest from 2000 to 2019. https://www.globalforestwatch.org/dashboards/country/IDN/15/ Greenpeace The opening of land for large-scale plantations has led to the loss of tropical rainforests and a significant decrease in biodiversity.	1. **BioBricks**: Eco-friendly bricks made from natural materials and industrial waste. 2. **Green Roof Systems**: Systems that convert roofs into green spaces to reduce heat and pollution. 3. **Eco-Friendly Construction Materials**: Materials that use less energy during production can be recycled. 4. **BioComposites**: Light yet durable natural composites for various applications. 5. **Marine-Friendly Anti-Fouling Paints**: Anti-fouling paints that do not harm marine life.
2.	Climate Change and Energy Consumption	Kementerian Energi dan Sumber Daya Mineral (ESDM), According to a report from the Ministry of Energy and Mineral Resources (ESDM), Kalimantan is heavily dependent on fossil fuels as its main energy source, contributing over 50% of total energy consumption in the region.	1. **Solar-Powered Ferries**: Ferries powered by solar energy are a more eco-friendly transport option. 2. **Energy-Efficient HVAC Systems**: Efficient building heating, ventilation, and cooling systems. 3. **Smart Lighting Systems**: Smart systems that regulate light intensity based on usage.
3.	Urbanization and Infrastructure Development	World Bank noted that the urbanization rate in Kalimantan has increased by 4% per year. Data from BPS (Statistics Indonesia) shows that Kalimantan's urban population reached 62% by 2020.	1. **Sustainable Urban Mobility Solutions**: Systems for more sustainable urban transportation, such as bus lanes and electric buses. 2. **Green Building Design**: Eco-friendly building designs that conserve energy and reduce waste. 3. **Rainwater Harvesting Systems**: Systems that collect and store rainwater in dry periods. 4. **Smart Port Solutions**: Smart solutions for ports to improve efficiency in logistics and goods transportation. 5. **Sustainable Urban Waterways**: Development of sustainable urban waterway systems for transport. 6. **Eco-Friendly Transport Ferries**: Eco-friendly ferries for river transportation.
4.	Cultural Heritage and Tourism	According to UNESCO, Kalimantan has several world heritage sites. Data from the Ministry of Tourism and Creative Economy shows an increase in the number of tourists visiting heritage and cultural sites in Kalimantan.	1. **Virtual Reality (VR) Cultural Tours**: VR cultural tours that immerse tourists in Kalimantan's heritage and cultural history. 2. **Augmented Reality (AR) Apps**: AR apps provide interactive information about Kalimantan's heritage and cultural sites. 3. **Eco-Tourism Vessels**: Environmentally friendly vessels for exploring Kalimantan's natural and cultural sites. 4. **Floating Cultural Centers**: Floating centers that showcase local culture and traditions
5.	Lack of Maritime Transport Infrastructure Supporting Accessibility Between Regions	Kementerian Perindustrian noted that industrial activity in Kalimantan increased, driving the need for maritime transport infrastructure. Data from the Central Bureau of Statistics (BPS) showed a significant increase in the contribution of the maritime sector to Kalimantan's economy.	**Equipment Manufacturing**: Manufacturing of maritime equipment such as navigation systems, safety equipment, and ship components, using local raw materials.

2.2.3.5 Cluster 5: Manufacturing and Green Industry

Indonesia is a young nation struggling with the development of its industry to further benefit from its rich natural and human capital resources. No place better captured this struggle than East Kalimantan, especially Balikpapan. This city was founded in 1897 in an effort to extract local oil deposits. Since then, this city has become a symbol of industrialization in Kalimantan and East Indonesia. Yet, the development of industries in Kalimantan and Indonesia is synonymous with overexploitation, leading to the degradation of regional ecosystems and habitats. Kalimantan became the leader in producing coal, wood products, and fossil fuels while suffering from pollution, droughts, peat fires, low rates of electrification, and fuel shortages.

The Manufacturing and Green Industry Research Centre (MGIRC), within Institut Teknologi Kalimantan in Balikpapan, contributes to the acceleration of local and regional industrial development sustainably. MGIRC research and development focuses are aligned with national (Nawa Cita) and global (SDGs) development goals, especially in the development of strategic industries (Nawa Cita #6 and #7, SDG #9) that are sustainable (SDG #11 and #12).

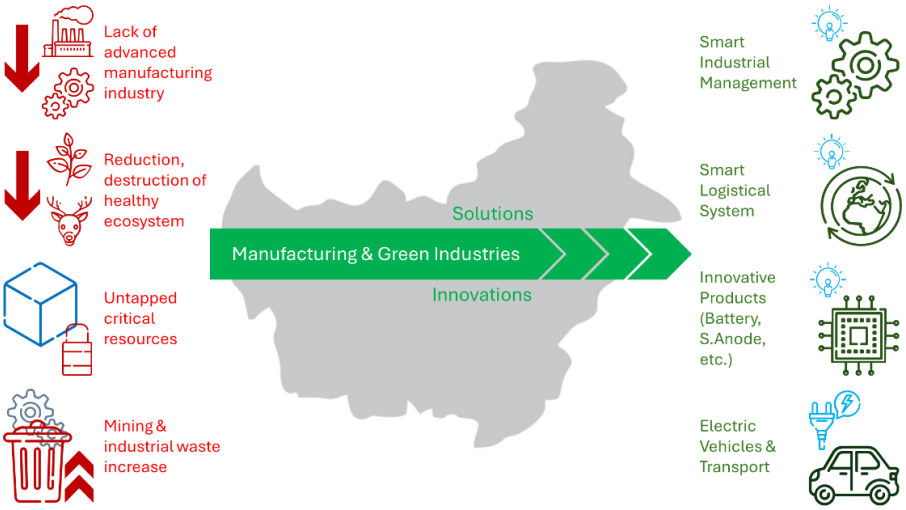


Figure 2.20 Illustration of Manufacturing and Green Industry

To reach its goal, MGIRC focuses on 3 short-term goals with 5 products:

- Industrial losses from corrosion can be reduced through the development of locally produced recycled sacrificial anodes with equal or better performance than imported sacrificial anodes. (Nawa Cita #6 and #7; SDG #9 and #12)
- Economical, durable, and mostly locally sourced **lithium** and **biobattery**, especially for areas with low coverage of grid systems, which are plenty in Kalimantan and East Indonesia. (Nawa Cita #3, #6, and #7; SDG #7 and #11)
- Electrification of transportation and industrial operations through developing and producing electric carts for industries and warehouses and **Enggang electric cars** for urban and rural communities. (Nawa Cita #6 and #7; SDGs #7 and #11)

Table 2.11 Relevant issues and potential products offered by Manufacturing and Green Industries Cluster

No	Issues	Supporting Information	Potential Products
1	Manufacturing industry in Kalimantan is still dominated by basic manufacturing	• East Kalimantan Statistics 2023	Development of high-value products from East Kalimantan resources in a sustainable way. Cost-effective and safe methods of the production of said products. **Examples**: Biomass batteries, electrical vehicles with high local content, logistical route and system

2	Rampant deforestation in Kalimantan due to expansion of palm oil and wood fiber plantation industries.	• Spatial–temporal variations in deforestation hotspots in Sumatra and Kalimantan from 2001–2018	Increasing productivity of existing plantations through logistical and processing improvements. Utilization of plantation waste to increase the economic value of the plantation industry and reduce waste production and greenhouse gas (GHG) emissions. **Examples**: Biomass batteries, electronic vehicles and drones, and low-carbon plantation systems.
3	Aluminum ore in Tanah Kuning, North Kalimantan, has not been processed due to lack of energy and infrastructure	• IKN - Bappenas Press Release	Sustainable and energy-effective aluminium extraction method, logistical route and system, high-value products from aluminium. **Examples**: Sacrificial anode, automotive and aviation parts, smart logistical and plant system
4	Heavy metal pollutants in the freshwater environment due to mining and post-mining operations in Kalimantan	• Post mining pollutions in East Kalimantan • Pollution in South Kalimantan mangroves	Improvement of mining waste management and utilization of waste materials from operation and post-mining. **Examples**: Metal extraction from mining waste, Smart waste management, advanced products from silica waste

Besides those goals and products, MGIRC also emphasizes its efforts on the development of national industry, especially in Kalimantan. Based on the current cooperations and future regional development, especially the development of the new Capital, Nusantara, there are several industrial fields with strong potential to cooperate with MGIRC:

1. **Oil, Gas, and Petrochemicals.** Despite current trends in the development and adoption of sustainable and renewable energies, Indonesia is still heavily reliant on fossil fuels. Furthermore, to anticipate the growth of the national economy and population, the Indonesian government, through the national oil company (PERTAMINA), expands the production capacity of all 6 refineries, including one in Balikpapan (Refinery Unit V). This project, called RDMP (Refinery Development Master Plan), became the most economically influential project in Balikpapan and Kalimantan, besides the construction project of Nusantara. ITK, especially MGIRC, has been involved in the RDMP project through collaborative research and consultations, especially in the field of parts inspection and quality control, and will continue to collaborate with PERTAMINA after the conclusion of the project, which is projected to be completed in 2025.
2. **Heavy Equipment and Machinery**. Current projects and industries in Kalimantan (Nusantara, RDMP, and various plantations and mining operations) generate high demand for heavy equipment. Thus, many representatives/sales, repair centers, and remanufacturing centers have been built in the Balikpapan area, mostly collaborating with ITK(MGIRC). Current (and projected future) collaborations and projects in this field are failure analysis, material analysis, and properties testing.
3. **Plantations**. Oil palm plantations have been a significant contributor to the Kalimantan economy, and palm oil from Kalimantan is the dominant cooking oil produced by Indonesia, besides Sumatra. Yet, palm oil production, along with coal mining, become the prime source of natural habitat degradation in Kalimantan. Thus, current and future MGIRC collaboration with palm oil producers focuses on the reduction of carbon footprint of the industry, mainly in the development of plantation waste as highly economical and sustainable products (battery, composites, coke for metal extraction) and electrification of plantation operations (harvesting, palm oil fruit transporting).
4. **Mining**. Mining operations in Kalimantan, especially in East Kalimantan, could be divided into 2 main categories. First, energy source mining comes in the form of oil and gas mining and coal mining. This type of mining has been discussed in points 1 and 2 above. The other part of mining is metal mining, which is focused on Sulawesi and Halmahera Islands. Although the main mining activity is not located in Kalimantan, there is 1 nickel smelter plant built near Balikpapan. Several ITK alumni have worked in nickel extraction plants in Sulawesi and Halmahera. Thus, MGIRC will collaborate in metal mining industries, especially nickel mining

(which has been designated as a strategic national industry. The projected collaboration will be in the field of the optimization of extraction operations.

2.2.4 Demand Projection

Table 2.12 outlines the projected outcomes for various customer segments and intellectual property outputs from 2029 to 2033. The projections indicate a steady increase in collaborations across different sectors, including large and medium manufacturing, higher education institutions, social communities, and government bodies. Specifically, partnerships with higher education institutions are expected to grow from 140 in 2029 to 160 in 2033, demonstrating a strong focus on academic collaboration. Intellectual property outputs, including patents, prototypes, licensed products, start-ups, and spin-offs, are also projected to rise significantly. The number of patents is expected to increase from 10 in 2029 to 50 in 2033, while licensed products and start-ups show similar growth trends. The profit sharing is projected to grow substantially, from IDR 1 billion in 2029 to IDR 4 billion in 2033. This growth reflects the potential for significant economic impact and innovation driven by these collaborative efforts and intellectual property developments.

Table 2.12 ITK STP demand projection

Type of outcomes	Projection each year				
	2029	2030	2031	2032	2033
Collaborations based on Customer Segment					
• Large and Medium Manufacturing	60	65	70	75	80
• Higher Education Institution	140	145	150	155	160
• Social Community	15	20	30	40	50
• Government	140	145	150	155	160
Intelectual Properties	100	205	315	431	552
Patent	10	20	30	40	50
Prototype	1	2	3	4	5
Licensed products	10	15	20	25	30
Start-ups	10	15	20	25	30
Spin-off	5	7	10	14	20
Profit Sharing (IDR)	1,000,000,000	1,400,000,000	2,000,000,000	2,800,000,000	4,000,000,000

CHAPTER 3
THE PROJECT

3.1 Project Scope and Components

This section outlines the comprehensive scope and components of the proposed project, focusing on the development of the Science Techno Park, which consists of a Technology Clusters Zone and an Innovation Ecosystem Zone. Both zone facilities are designed to enhance research capabilities, foster innovation, and support the commercialization of new technologies. To better explain the proposed project components, Figure 3.1 highlights the relationship between the existing laboratory facilities and the proposed ITK STP project.

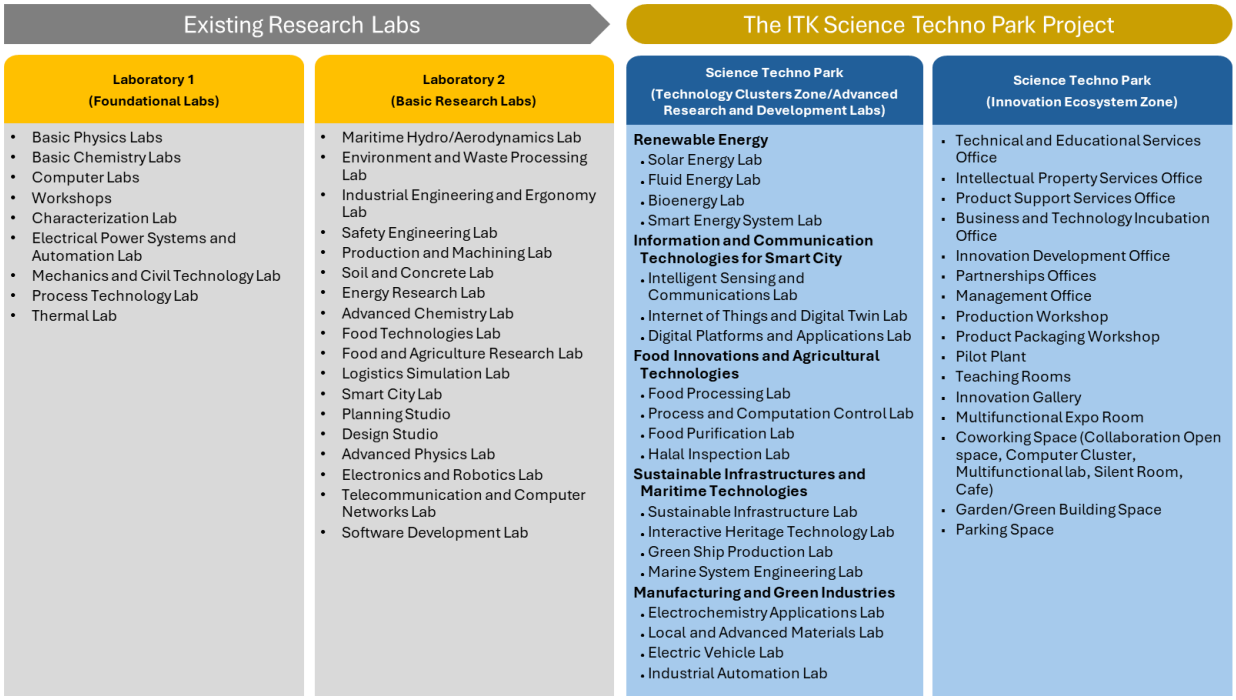


Figure 3.1 Relationship between the existing laboratories and the ITK Science Techno Park

The proposed ITK Science Techno Park (STP) project is set to achieve targets in hardware development and human resource development that will enhance the institution's capabilities in research, innovation, and technology commercialization. Central to this project is the construction of two advanced facilities: the Technology Clusters Zone and the Innovation Ecosystem Zone. These zones will extend the capabilities of existing research labs, creating a seamless integration between basic research and applied innovation. These buildings are designed to provide state-of-the-art environments where researchers, entrepreneurs, and industry partners can collaborate and push the boundaries of innovation. Alongside the physical infrastructure, the project emphasizes the procurement of cutting-edge equipment that will be housed within these new facilities. This equipment is essential for enabling high-impact research and the development of innovative technologies, ensuring that ITK remains at the forefront of scientific advancement. The project is deeply committed to human resource development, focusing on providing scholarships that will prepare students, researchers, and professionals to drive innovation and effectively collaborate with industries. These scholarships are aimed at equipping individuals with the necessary skills and knowledge to excel in high-tech industries and contribute to the success downstream of research products. By focusing on both infrastructure and human capital, the ITK STP project aims to create a thriving ecosystem that not only supports groundbreaking research but also drives the commercialization of new technologies, positioning ITK as a leader in innovation.

The ITK Science Techno Park (STP) project aims to bridge the gap between fundamental research and technology's practical application and commercialization. The existing research labs at ITK are currently divided into two main categories: Laboratory 1 (Foundational Labs) and Laboratory 2 (Basic Research Labs). These facilities primarily focus on fundamental research, encompassing Technology Readiness Levels (TRL) 1 to 3. They provide essential infrastructure for basic sciences, including physics, chemistry, computer science, electrical engineering, and more specialized areas like maritime hydro/aerodynamics, industrial engineering, and environmental science. The STP project, on the other hand, is designed to advance technologies beyond the foundational stages, targeting TRL 4 to 6 (technology validation and prototype development) and TRL 7 to 9 (system demonstration and deployment). The STP will have two main zones: the Technology Clusters Zone and the Innovation Ecosystem Zone.

1. Technology Clusters Zone: This zone will house advanced research and development labs focusing on specific industry clusters, including Renewable Energy, ICT for Smart City, Food Innovations and Agricultural Technologies, Sustainable Infrastructures and Maritime Technologies, and Manufacturing and Green Industries. The labs in this zone will support the development and scaling of technologies through pilot testing, validation, and demonstration. Key facilities will include labs for solar energy, bioenergy, intelligent systems, digital platforms, food processing, and advanced materials, among others. The goal is to enhance the transition of technologies from the lab to the market, addressing real-world challenges and creating commercially viable solutions.
2. Innovation Ecosystem Zone: This zone will complement the Technology Clusters Zone by offering comprehensive support services crucial for the commercialization of innovations. It will provide spaces for business incubation, intellectual property services, and product support, including workshops for product design, packaging, and testing. Additionally, this zone will feature collaborative spaces like a coworking space, multifunctional meeting rooms, and an innovation gallery. These facilities are designed to foster collaboration among researchers, entrepreneurs, and industry partners, accelerating the development of spin-offs and start-ups.

Despite developing the hardware facilities, the ITK STP project will also focus on developing human resources. The project will increase the quality of lecturers by providing opportunities for further education through scholarships and facilitating special lectures conducted by industry experts, researchers, and visiting fellows. These programs are intended to enhance the skills and expertise of researchers, students, and faculty members, ensuring that they are well-equipped to contribute to technology development and commercialization. In addition to enhancing faculty expertise, the project will also involve revisions of the current syllabus and curriculum across relevant programs to ensure that they are aligned with the latest industry demands and technological advancements. This may include the integration of new courses, modules, or workshops focused on emerging technologies and entrepreneurship, thereby equipping students and researchers with the skills and knowledge needed to translate innovative ideas into market-ready products and services.

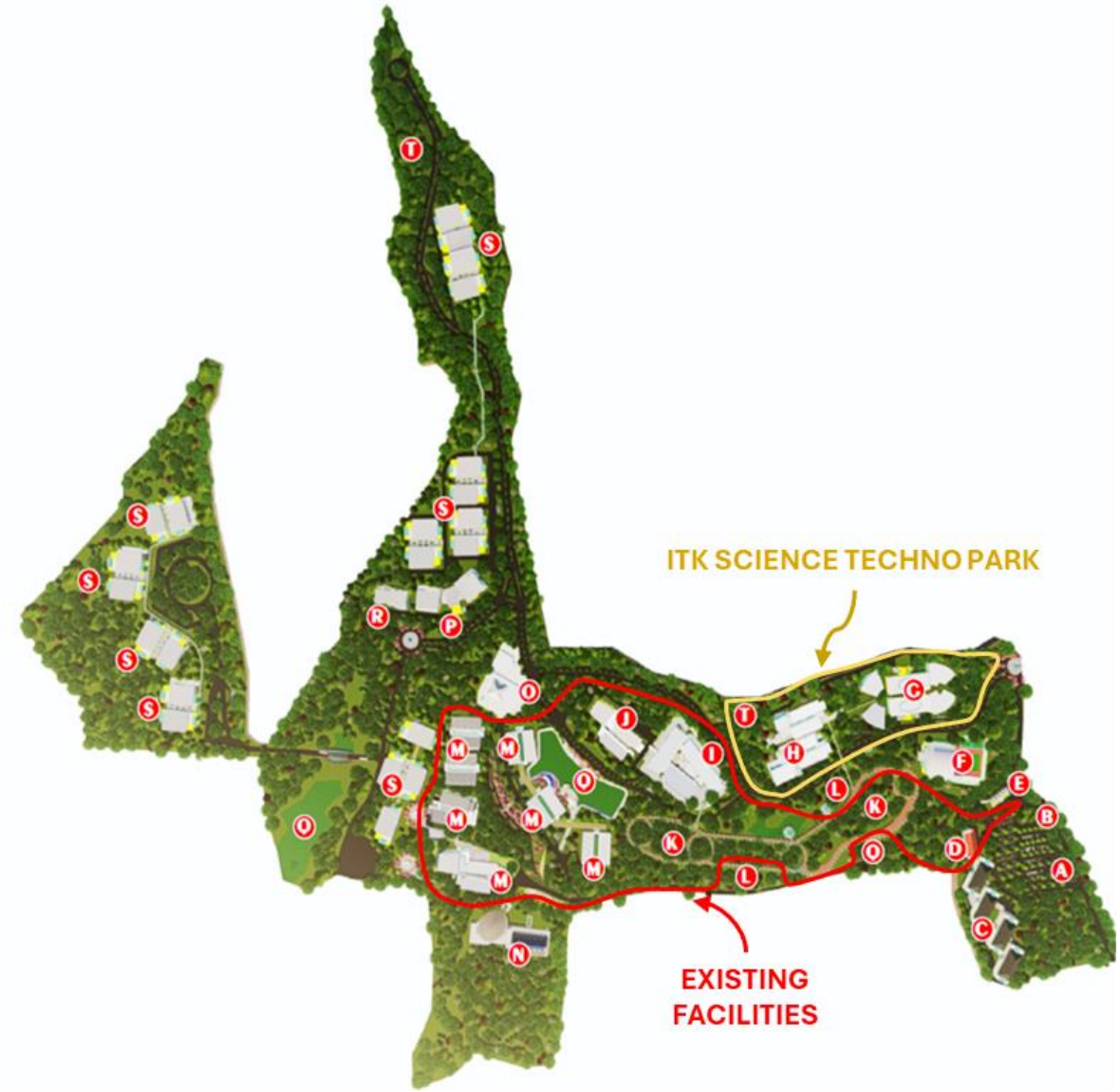
The STP project is thus a strategic initiative to elevate ITK’s research capabilities, moving beyond basic research to more applied and advanced stages of technology development. It aims to foster a dynamic innovation ecosystem that supports the full spectrum of technology readiness, from initial concept to market-ready products. By establishing the STP, ITK seeks to play a pivotal role in driving technological innovation and economic development in the region, leveraging its existing strengths in fundamental research and extending them into impactful, practical applications. ITK will harness its established capabilities in fundamental research, particularly within its advanced laboratories and research centres. The STP will act as a bridge between academia and industry, facilitating the translation of theoretical research into real-world solutions, especially by improving the existing centre of IP Rights and business and technology incubation offices.

The implementation and success of this project will contribute to and accelerate the realisation of the vision of ITK's STP. The Technology Clusters Zone will support the acceleration of ITK research product commercialization, with the availability of advanced tools and space to the development of prototypes from lower TRL research. In short, the Technology Clusters Zone will bolster ITK's strengths into practical, impactful innovations. From there, the Innovation Ecosystem Zone will become a fine incubation area for innovations from the Technology Clusters Zone to potent mass products. The Innovation Ecosystem Zone will become a place where intimate relationships between ITK researchers and regional industries will be built, legal support around the innovation/product will be established, and plans for mass production, marketing, and further product development will be executed.

The STP project has been included in the ITK master plan depicted in **Error! Reference source n ot found.**. The master plan highlights various facilities and infrastructure developments aimed at enhancing the campus's research and educational environment. The plan includes essential amenities like public parking, a food court, and dormitories, which are vital for supporting student and staff life on campus. A Science Techno Park (STP) is prominently featured and divided into two key areas: the Innovation Ecosystem and the Technology Clusters/Advanced Labs. This reflects ITK's strategic initiative to transition from basic research to applied and advanced stages of technology development. The inclusion of integrated laboratories, a student service center, and educational buildings further emphasize ITK's commitment to providing comprehensive support for both academic and research activities. Additional features like a jogging track, prayer area, and waste management area showcase a holistic approach to campus development, ensuring that the physical environment supports the well-being of its community.

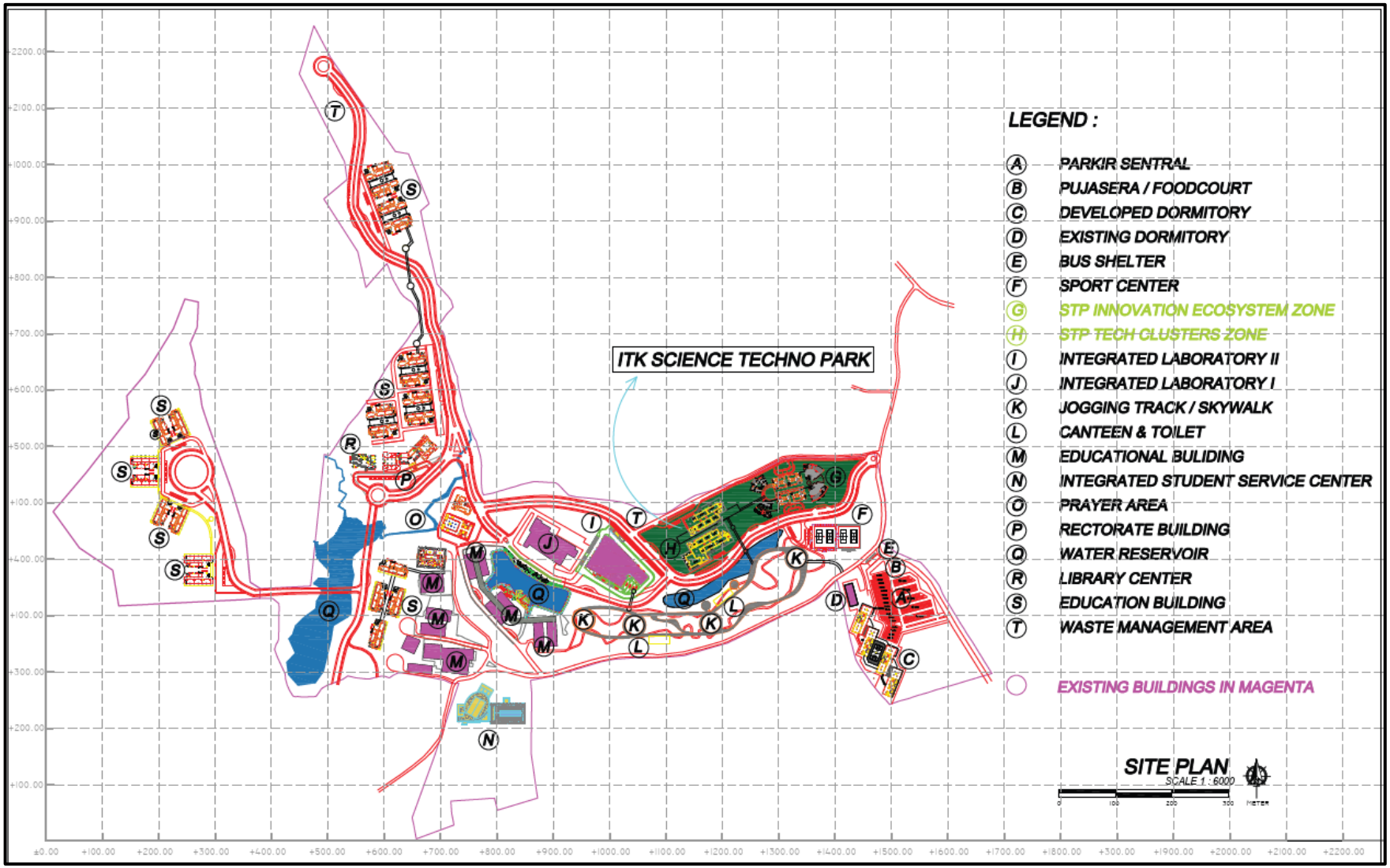
To strengthen the contribution of ITK nationally through increased innovation capacity therefore, ITK proposed several activities within the development project, which consists of the following activities:

1. Building and strengthening of infrastructure for 5 (five) technology-driven innovation centers and two buildings that support departments, namely:
    a. Technology Clusters Zone: Center for Renewable Energy, Center for ICT for Smart City, Center for Food Innovations and Agricultural Technologies, Center for Sustainable Infrastructures and Maritime Technologies, Center for Manufacturing and Green Industries
    b. Innovation Ecosystem Zone: Technical and Educational Services Office, Intellectual Property Services Office, Product Support Services Office, Business and Technology Incubation Office, Innovation Development Office, Partnerships Offices, Management Office, Production Workshop, Product Packaging Workshop, Pilot Plant, Teaching Rooms, Innovation Gallery, Multifunctional Expo Room, Coworking Space (Collaboration Open space, Computer Cluster, Multifunctional lab, Silent Room, Cafe), Garden/Green Building Space, Parking Space
2. Procurement of facilities and equipment Laboratory in strategic areas above.
3. Scholarships for Doctoral Program (S-3), research grants, and non-degree training
4. Provision of Experts and program initiation for the 5 centers.
5. Project management.



(a)

A. PUBLIC PARKING
B. FOODCOURT
C. FUTURE DORMITORY
D. EXISTING DORMITORY
E. BUS SHELTER
F. SPORT CENTER
G. SCIENCE TECHNO PARK (INNOVATION ECOSYSTEM ZONE)
H. SCIENCE TECHNO PARK (TECHNOLOGY CLUSTERS ZONE/ ADVANCED R&D LABS)
I. INTEGRATED LABORATORY II
J. INTEGRATED LABORATORY I
K. JOGGING TRACK / SKYWALK
L. CANTEEN & TOILET
M. TEACHING BUILDING
N. INTEGRATED STUDENT SERVICE CENTER
O. PRAYER AREA
P. RECTORATE BUILDING
Q. WATER RESERVOIR
R. LIBRARY CENTER
S. EDUCATION BUILDING
T. WASTE MANAGEMENT AREA



(b)

Figure 3.2 Location of Science Techno Park in the ITK master plan: (a) Aerial view, (b) AutoCAD view

The output of the proposed activities is as follows:

1. Development and support of center infrastructure.
2. Infrastructure development and support for relevant R&D (e.g., product design, digital business, etc.) that enhances center development.
3. Provision of laboratory equipment in strategic areas.
4. Scholarship programs for doctoral students aimed at bolstering innovation in the centers.
5. Non-degree training programs for administrative and laboratory staff to enhance their capabilities in supporting innovative product development in strategic areas and managing the STP.

The anticipated outcomes and impacts from the transformation of ITK into PTNBH, contributing to Indonesia's technological innovation capacity, are as follows:

1. ITK's capability to generate innovation and R&D outputs that can be commercially produced and utilized by industry and the community will increase by 300% by the end of the program period.
2. The number of international publications indexed by Scopus will grow by 70% over a five-year period.
3. The number of student tenants, SMEs, and alumni incubated in ITK innovation centers will increase by 300% over five years.
4. Collaborations with industry, government, and international institutions will rise by 70% over five years.
5. Participants in education, training, and certification programs will increase by 8% annually.
6. The annual revenue of SMEs emerging from ITK innovation centers will grow by 40% each year.

To further enhance ITK's national contribution by increasing its innovation capacity, several areas need strengthening:

1. Infrastructure Enhancement: ITK needs to strengthen its infrastructure, particularly its innovation center, through the construction of new facilities and the acquisition of advanced laboratory equipment. This will enable the production of intellectual outputs from research that can lead to innovative products and their commercialization.
2. Human Resource Development: ITK needs to bolster its human resources, including lecturers, technicians, and students, to improve research capabilities that lead to innovative products and their transformation into commercial products.
3. Program Infrastructure Improvement: Alongside the innovation center, ITK must upgrade the infrastructure and equipment of study programs related to the innovation focus areas.
4. Networking Strengthening: ITK needs to enhance its networking with government, industry, SMEs, alumni, international institutions, and national universities in Eastern Indonesia. This will contribute more significantly to national economic development and human resource development.

3.1.1 Hardware Development

The development area for ITK is situated in the northern part of the ITK campus in Balikpapan, encompassing 8 hectares dedicated to establishing a Science and Technology Park (STP). According to the ITK Master Plan, this space is intended for commercial and teaching industry purposes and is already supported by Integrated Laboratory 1 and Integrated Laboratory 2. In addition to this designated area, ITK has a significant amount of undeveloped land within its main campus, which spans approximately 300 hectares. Currently, only one-sixth of this land is utilized, with a minimum of 30% mandated to remain as green space. This leaves around 250

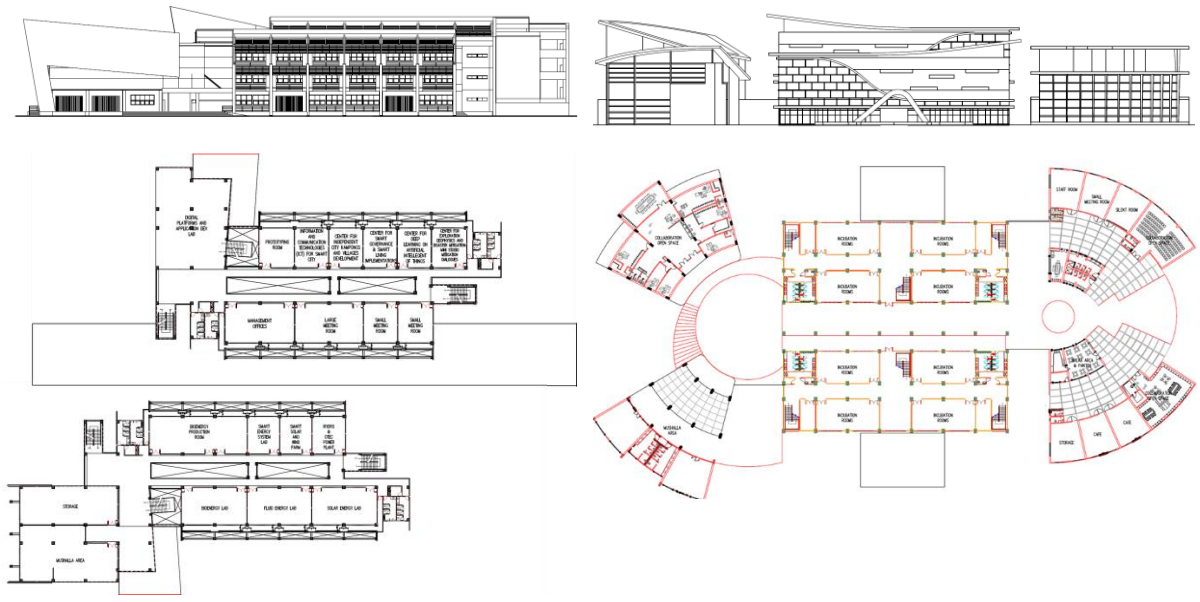
hectares available for further development to support ITK's academic, research, and innovation activities.

Building Construction

Figure 3.3 and Figure 3.4 illustrate the 3D and AutoCAD designs of the ITK Science Techno Park (STP). The figure showcases two key components of the STP: the Technology Clusters Zone and the Innovation Ecosystem Zone. Each zone is designed to accommodate facilities for technology creation and commercialization, fostering a dynamic environment for innovation. The plan includes a variety of common facilities aimed at enhancing the functionality and appeal of the technopark. These facilities include a workshop for hands-on projects and prototyping, a design center for fostering creativity and developing new technologies, and an exhibition hall for showcasing innovations, research findings, and commercial products. There will also be retail spaces such as shops and a souvenir shop, along with a food court providing diverse dining options for students, staff, and visitors.

(a) (b)

Figure 3.3 Three-dimensional designs of ITK Science Techno Park: (a) The technology clusters zone (advanced research and development labs), (b) The innovation ecosystem zone



(a) (b)

Figure 3.4 AutoCAD designs of ITK Science Techno Park: (a) The technology clusters zone (advanced research and development labs), (b) The innovation ecosystem zone

The Technology Clusters Zone, depicted in Figure 3.3 (a) and Figure 3.4 (a), is designed to house advanced research and development laboratories within TRL4-7. These facilities will support various specialized research areas, including renewable energy, ICT for smart cities, food

innovations, sustainable infrastructures and maritime, manufacturing and green industries. The layout and design are intended to facilitate cutting-edge research and collaboration among scientists, engineers, and industry professionals. Figure 3.3 (b) of the figure illustrates the Innovation Ecosystem Zone, which serves as a hub for supporting innovation, business incubation, and technology transfer activities. This zone is crucial for fostering entrepreneurship and facilitating the commercialization of new technologies developed within the STP. It provides infrastructure and services to startups and spin-off companies, including business incubation spaces, collaborative workspaces, and support services.

The Building Cost Summary for the ITK Science Techno Park, as seen in Table 3.1, outlines the detailed financial requirements for constructing two major zones: the Innovation Ecosystem Zone and the Technology Clusters Zone. The Innovation Ecosystem Zone, covering an area of 8,002.5 square meters, has a total construction cost of approximately IDR 72.13 billion (JPY 699.66 million). This cost is distributed across four floors, with the first floor accounting for IDR 21.01 billion (JPY 202.87 million). The Technology Clusters Zone, slightly smaller at 7,531.875 square meters, has a total construction cost of around IDR 66.84 billion (JPY 643.58 million). The costs for this zone are similarly broken down by the floor, with the first floor incurring the highest cost at IDR 27.57 billion (JPY 266.32 million). The total specific building costs, encompassing all detailed expenditures for both zones, amount to approximately IDR 228.14 billion (JPY 2.20 billion). The overall cost for the entire construction project, including both the Innovation Ecosystem Zone and the Technology Clusters Zone, totals IDR 366.91 billion (JPY 3.54 billion). This comprehensive budget covers all aspects of construction, including materials, labor, and other associated costs, ensuring the development of state-of-the-art facilities that will support advanced research, innovation, and business incubation activities at ITK.

Table 3.1 Building construction cost

No	Facility	Total Area (m2)	Cost (IDR)	Cost (JPY)
A	**TECHNOLOGY CLUSTERS ZONE**	**7531.875**	**66,636,445,263**	**643,581,662**
A.1	1st Floor	3305.625	27,574,532,063	266,317,675
A.2	2nd Floor	2203.125	20,160,455,170	194,711,756
A.3	3rd Floor	2023.125	18,901,458,030	182,552,231
B	**INNOVATION ECOSYSTEM ZONE**	**8002.5**	**72,132,880,023**	**696,666,796**
B.1	1st Floor	2518.125	21,005,443,313	202,872,738
B.2	2nd Floor	1775.625	16,248,468,976	156,929,389
B.3	3rd Floor	1876.875	17,535,087,570	169,355,684
B.4	4th Floor	1831.875	17,343,880,165	167,508,984
C	**SPECIFIC BUILDING COSTS** (Land clearing, utilities, air conditioner, elevator, sound system, telephone, IT installation, electrical, fire protection, lighting, sewage, interior, combustion, hazard prevention, deep foundation, disabled-friendly design, environmental friendly design, legalization)		**228,137,880,925**	**2,203,379,186**
D	**TOTAL BUILDING CONSTRUCTION COST (A+B+C)**		**366,907,206,211**	**3,543,627,644**

*Exchange rate: 1 JPY = 102.89 IDR, date: Jul 1, 2024

Equipment

Education, research, and community service are intricately connected within the framework of ITK's teaching industry development. In essence, an education system focused on innovation must be supported by innovative research, which in turn should lead to the production of innovative products. These elements are all accommodated by the Science and Technology Park (STP) at ITK. Fundamentally, the STP ITK will act as a bridge connecting various engineering needs with the development of science, technology, and the arts in Indonesia and the region. This will be achieved through seven major activities: advanced research and development activities, prototyping, training, patent and intellectual property rights, business incubation, provision of facilities and space for tenants, implementation of marketing programs and funding, and training.

The research process at ITK is largely driven by institutional agendas, with input and research proposals coming from within ITK as well as the ITK STP. Research activities, particularly applied research, are conducted by various ITK departments, faculties, and the Research Institute

(LPPM). Prototyping, testing, and certification processes are predominantly managed by ITK, with support from all ITS laboratories and units. If prototypes meet market demands through commercial assessments, the STP ITK will then incubate these innovations to develop business potential, potentially collaborating with other business units within the STP ITK. Prior to mass production, the process of securing intellectual property rights, mainly in Indonesia, will be handled by ITK's Quality Assurance Agency and Intellectual Property Rights department. Commercial activities, including promotion, marketing, financing, and professional training, will be actively managed by STP ITK.

Table 3.2 provides a detailed breakdown of the equipment costs for various laboratories and facilities within the ITK Science Techno Park (STP). It categorizes the costs by clusters, including Renewable Energy, Manufacturing & Green Industries, Sustainable Infrastructures and Maritime Technologies, Information and Communication Technologies, and Food Innovations and Agricultural Technologies. Additionally, it covers the Innovation Ecosystem Zone, detailing the expenses associated with setting up technical services, intellectual property services, business and technology incubation offices, and other essential facilities. This comprehensive overview highlights the significant investment in state-of-the-art equipment necessary to support the advanced research, development, and commercialization activities integral to the STP's mission.

Table 3.2 Equipment cost

Cluster	#	Code	Laboratory	Sub Total (IDR)	Sub Total (JPY)	Total (IDR)	Total (JPY)
Technology Clusters Zone							
Renewable Energy	1	SOE	Solar Energy Laboratory	4,112,161,250	39,966,578		
	2	FLE	Fluid Energy Laboratory	5,248,125,000	51,007,144		
	3	BIE	Bioenergy Laboratory	14,376,395,000	139,725,872		
	4	SMS	Smart Energy System Laboratory	2,898,378,261	28,169,679		
	5	SSW	Smart Solar and Wind Farm	811,625,000	7,888,279		
	6	BIP	Bioenergy Production Room	12,905,279,000	125,427,923		
	7	HYO	Hydro & OTEC Power Plant	988,130,000	9,603,752	41,340,093,511	401,789,226
Manufacturing & Green Industries	8	ELM	Electro-materials Lab	28,288,105,641	274,935,423		
	9	EVM	Electric Vehicle Mini Plant	28,474,853,950	276,750,451	56,762,959,591	551,685,874
Sustainable Infrastructures and Maritime Technologies	10	SIM	SIMT Laboratory	3,196,335,000	31,065,555		
	11	NWI	Network and Infrastructure	5,383,800,000	52,325,785		
	12	PRR	Prototyping Room	2,519,360,000	24,485,956		
	13	SUI	Sustainable Infrastructure Lab	10,624,966,524	103,265,298		
	14	MSE	Marine Systems Engineering	4,388,480,173	42,652,154		
	15	GSP	Green Ship Production Lab	1,674,626,049	16,275,887		
	16	GCR	Green Construction Room	1,938,510,000	18,840,606		
	17	IHT	Interactive Heritage Technology Lab	1,024,200,000	9,954,320		
	18	MSW	Marine System Workshop	199,000,000	1,934,104	30,949,277,746	298,865,563
Information and Communication Technologies	19	DPL	Digital Platform and Application Dev Lab	10,066,176,250	97,834,350		
	20	ISC	Intelligent Sensing and Communication Lab	5,161,519,020	50,165,410		
	21	DTI	Digital Twin and IoT Lab	9,605,100,000	93,353,096		
	22	PRP	Prototyping Room	15,929,442,301	154,820,121		
	23	SVR	Server Room	10,482,493,800	101,880,589	51,244,731,371	498,053,566
Food Innovations and Agriculture Technologies	24	FCH	Food Characterization	8,257,277,178	80,253,447		
	25	FMI	Food Mycrobiology Laboratory	1,116,183,910	10,848,323		
	26	PCC	Process and computation control laboratory	1,196,649,114	11,630,373		
	27	HAI	Halal Inspection Laboratory	24,253,063,400	235,718,373		
	28	PLA	Pilot Plant	15,682,739,479	152,422,388	50,505,913,081	490,872,904
Innovation Ecosystem Zone							
Innovation Ecosystem Zone	29	TEC	Technical Services Office	197,000,000	322,645,544		
	30	IPS	Intellectual Property Services Office	197,000,000	1,914,666		
	31	BTI	Business and Technology Incubation Office	197,000,000	1,914,666		
	32	R&D	R&D Product Support Services Office	197,000,000	1,914,666		

Cluster	#	Code	Laboratory	Sub Total (IDR)	Sub Total (JPY)	Total (IDR)	Total (JPY)
	33	MO	Management Office	440,000,000	4,276,412		
	34	PAR	Partnership Office	197,000,000	1,914,666		
	35	COM	Computer Cluster	2,460,000,000	23,909,029		
	36	COL	Collaboration Open Space	548,400,000	5,329,964		
	37	MUL	Multifunctional Expo Room	266,000,000	2,585,285		
	38	SIL	Silent Room	6,154,305,750	59,814,421		
	39	CAF	Cafe	93,000,000	903,878		
	40	LOB	Lobby Receptionist	33,000,000	320,731		
	41	INN	Innovation Gallery	905,000,000	8,795,801		
	42	SMR	Small Meeting Room	1,764,000,000	17,144,523		
	43	LMR	Large Meeting Room	1,015,500,000	9,869,764		
	44	INC	Incubation Room	1,380,000,000	13,412,382		
	45	STF	Staff Room	920,000,000	8,941,588		
	46	TEA	Teaching Room	745,000,000	7,240,743		
	47	ROO	Rooftop Garden/Green Building Space	318,000,000	3,090,679	51,027,205,750	495,939,409
	High-speed Internet					33,000,000,000	320,730,878
	Digital Library (Journal subscriptions)					6,014,305,750	58,453,744
Grand Total						**281,830,181,050**	**2,737,206,541**

*Exchange rate: 1 JPY = 102.89 IDR, date: Jul 1, 2024

3.1.2 Human Resource Development

Strengthening institutional and human resources capabilities at STPs is essential for ensuring efficient operations and maintaining high standards. By reviewing and updating business models and SOPs, STPs can adapt to evolving market needs and improve their service quality. Implementing robust quality systems and obtaining necessary certifications also build credibility and enhance operational effectiveness. These improvements not only streamline processes but also position STPs as reliable and competitive players in the technology sector.

Developing human resources is crucial for building a skilled and knowledgeable workforce. Training programs, certifications, and advanced education opportunities empower STP managers and professionals with the expertise needed to navigate complex technological and business challenges. By investing in competencies such as technology assessment, negotiation, and IP management, STPs can ensure that their staff are equipped to drive innovation and manage resources effectively. This, in turn, enhances the overall performance and strategic capability of the STP. Fostering innovation within STPs involves creating an environment that supports product development, quality implementation, and effective startup management. By focusing on internal evaluations and obtaining certifications for hub management and procurement practices, STPs can ensure that their innovation processes are efficient and aligned with global standards. Disseminating knowledge and staying informed about industry trends further supports the STP's ability to innovate and remain at the forefront of technological advancements. This holistic approach drives successful technology commercialization and supports sustainable growth.

Table 3.3 outlines the financial requirements for various software development and training activities within the ITK Science Techno Park (STP). This comprehensive breakdown includes costs associated with different activity components, such as business model reviews, technology assessments, database development, and various training programs. The table provides detailed pricing information in different currencies and the total costs in Indonesian Rupiah (IDR) and Japanese Yen (JPY). These activities are crucial for building the software infrastructure and human resource capabilities necessary to support the advanced technological and business initiatives at the STP.

Table 3.3 Human resource development cost

Activity Component	Qty	Unit	Currency	Price in Original Currency	Total in OC	Total in IDR	Total in JPY
Business Model Review	120	Person	IDR	9,800,860	1,176,103,200	1,176,103,200	11,430,685

Business Plan Review (5 years)	120	Person	IDR	9,800,860	1,176,103,200	1,176,103,200	11,430,685
Preparation & Review of SOPs	120	Person	IDR	9,800,860	1,176,103,200	1,176,103,200	11,430,685
Implementation of a quality system	120	Person	IDR	9,800,860	1,176,103,200	1,176,103,200	11,430,685
Service laboratory certification and pre-clinical testing	120	Person	IDR	31,114,289	3,733,714,629	3,733,714,629	36,288,411
Study Visit STP, IBT & TTO in Overseas	48	Person	JPY	296,433	14,228,788	1,464,000,000	14,228,788
Development of Integrated Database and Information Systems	120	Person	IDR	12,658,860	1,519,063,200	1,519,063,200	14,763,954
Promotional Media Development	120	Person	IDR	9,800,860	1,176,103,200	1,176,103,200	11,430,685
Fellowship	30	Person	JPY	4,440,000	133,200,000	13,704,948,000	133,200,000
Visiting Professor	12	Person	IDR	65,700,000	788,400,000	788,400,000	7,662,552
Technology Assessment Competency Training (Technology Assessor)	12	Person	IDR	18,600,000	223,200,000	223,200,000	2,169,307
Business deal Competency Training (Negotiator)	12	Person	IDR	12,000,000	144,000,000	144,000,000	1,399,553
Rule of Laws Competency Training (Legal Interpreter)	12	Person	IDR	13,600,000	163,200,000	163,200,000	1,586,160
Teaching Industry Quality Management Competency Training	12	Person	IDR	19,600,000	235,200,000	235,200,000	2,285,936
Equipment & Engineering Analyst Competency Training	12	Person	IDR	17,600,000	211,200,000	211,200,000	2,052,678
Financial Analyst Competency Training (online)	12	Person	IDR	8,000,000	96,000,000	96,000,000	933,035
ISO Competency Training/Certification (ISO 9001)	12	Person	IDR	90,000,000	1,080,000,000	1,080,000,000	10,496,647
ISO Competency Training/Certification (GMP)	12	Person	IDR	12,100,000	145,200,000	145,200,000	1,411,216
Communicate or Die – Marketing New Technologies	12	Person	AUD	6,650	79,800	877,800,000	8,531,441
Valuing Intellectual Property	12	Person	IDR	45,600,000	547,200,000	547,200,000	5,318,301
Negotiation for Technology Transfer Professionals	12	Person	IDR	5,601,300	67,215,600	67,215,600	653,276
Ownership and Control of Intellectual Property Rights Training Course	12	Person	IDR	9,600,000	115,200,000	115,200,000	1,119,642
Strategic IP Planning Training Course (Online)	12	Person	GBP	1,600	19,200	399,417,600	3,881,987
Reviewing and Negotiating Technology Transfer and Licensing Agreements Training Course	12	Person	IDR	8,200	98,400	1,621,390,920	15,758,489
STP Management Internship Overseas (UK)	24	Person	GBP	13,000	312,000	6,490,536,000	63,082,282
TTO Management Internship Overseas	12	Person	USD	13,000	156,000	2,570,497,800	24,982,970
IP Distance Learning Program (WIPO - online course)	12	Person	USD	200	2,400	39,546,120	384,353
Registered Technology Transfer Professionals (RTTP) (ASTP online course)	12	Person	USD	500	6,000	98,865,300	960,883
Product Development	125	Person	IDR	30,000,000	3,750,000,000	3,750,000,000	36,446,691
Implementation of quality systems,	20	Person	IDR	3,150,000	63,000,000	63,000,000	612,304
Startup selection and Matching	100	Person	IDR	6,250,000	625,000,000	625,000,000	6,074,448
Internal Evaluation for Startups	50	Person	IDR	3,150,000	157,500,000	157,500,000	1,530,761
Hub management ISO certification	10	Person	USD	4,100	41,000	675,579,550	6,566,037

Goods Procurement Certification	10	Person	IDR	18,100,000	181,000,000	181,000,000	1,759,160
Dissemination and Travel	20	Person	IDR	14,600,000	292,000,000	292,000,000	2,837,982
Journal Publication	25	Paper	IDR	50,000,000	1,250,000,000	1,250,000,000	12,148,897
Conference Publications	25	Paper	IDR	25,000,000	625,000,000	625,000,000	6,074,448
Patent Publication	20	Patent	IDR	20,000,000	400,000,000	400,000,000	3,887,647
Products	20	Product	IDR	15,000,000	300,000,000	300,000,000	2,915,735
Scholarship	30	Person	JPY	11,620,000	348,600,000	35,867,454,000	348,600,000
TOTAL						**86,402,844,719**	**839,759,616.2**

*Exchange rate: 1 JPY = 102.89 IDR, 1 AUD = 11,000 IDR ; 1 USD = 16,477.55 IDR; 1 GBP = 20,803 IDR, date: Jul 1, 2024

3.2 Organizational Structure

3.2.1 Proposed Management Structure and Decision Making Processes

The organizational structure of the Science Techno Park (STP) at Institut Teknologi Kalimantan (ITK) is designed to optimize the management and delivery of various services aimed at fostering innovation and business development. As shown in Figure 3.5, At the helm of the organization is the Rector of ITK, who oversees the entire operation of the STP. Reporting directly to the Rector is the Chief of ITK STP, who is responsible for the overall management and execution of the park's activities.

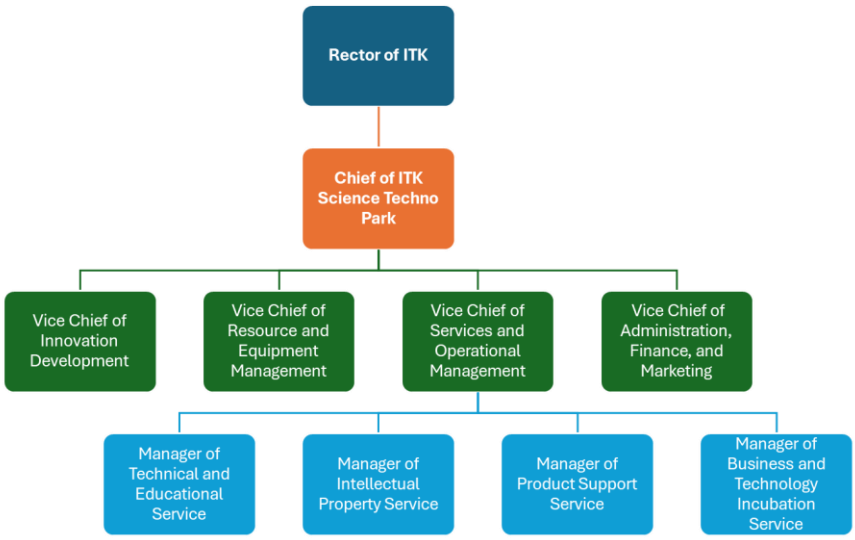


Figure 3.5 Organization structure of ITK Science Techno Park

Under the **Chief of ITK Science Techno Park**, there are four Vice Chiefs, each overseeing specific divisions, with several managers reporting to the Vice Chief of Service Management:

1. **Vice Chief of Innovation Development:** This role is responsible for ideation and advancing innovation within the STP. The Vice Chief of Innovation Development works closely with researchers, LPPM, Research Centers, Center of Excellence, Laboratories, and industry partners to identify emerging trends and opportunities for new projects. They oversee the initiation and management of innovative projects, ensuring that the park remains at the forefront of technological advancements.
2. **Vice Chief of Resource and Equipment Management:** This position oversees the maintenance and development of the physical and technological infrastructure of the STP, as well as managing human resources. The Vice Chief of Infrastructure and Equipment Management ensures that all facilities and equipment are up-to-date and functioning efficiently. They manage the procurement, installation, and maintenance of advanced technological equipment necessary for research and development activities. Additionally, they oversee human resource management, including recruitment, employee relations, and

staff development, ensuring that the park has a skilled and motivated workforce to support its operations.

3. **Vice Chief of Services and Operational Management:** This Vice Chief oversees all service-related and operational functions within the STP. They ensure that all support services are provided effectively to the park's users. Managers reporting to this Vice Chief include:
    - **Manager of Technical and Educational Services:** Provides comprehensive technical support, offers technical consultation, and oversees educational programs, workshops, and training sessions.
    - **Manager of Intellectual Property Services:** Manages intellectual property rights within the STP, including drafting and filing patents, managing the IP portfolio, technology transfer, and facilitating the licensing and commercialization of technologies.
    - **Manager of Product Support Services:** Ensures that all products developed within the STP receive the necessary support to reach the market, including overseeing product design, prototyping, testing, production facilities, and quality assurance processes.
    - **Manager of Business and Technology Incubation Services:** Supports startups and spin-off companies by providing incubation programs that include mentoring, access to funding, business development services, and networking opportunities. The goal is to nurture entrepreneurship and facilitate the growth of new ventures emerging from the STP.
4. **Vice Chief of Administration, Finance, and Marketing:** This role focuses on the administrative, financial, and promotional aspects of the STP. The Vice Chief of Administration and Marketing develops and implements marketing strategies to promote the park's products, services, and innovations. They build brand awareness, attract potential partners, investors, and customers, and manage public relations. Additionally, they organize events to showcase the park's achievements and coordinate administrative functions to ensure smooth operations.

Outside the organization, the Chief and Vice Chiefs of STP work closely with the Head of the Institute for Research and Community Services (LPPM) and the Head of UPA Laboratory. These roles are critical in integrating academic research with practical applications in industry and the community, thereby aligning the STP's activities with ITK's broader mission and objectives. This well-organized structure allows the STP at ITK to efficiently support technological innovation, foster business development, and facilitate collaboration within the university and with external partners, enhancing its role as a catalyst for regional development in science and technology.

Facilities and equipment maintenance is crucial for ensuring the operational efficiency, safety, and longevity of an organization's physical assets. As shown in Figure 3.5, the ITK STP will have a Vice Chief of Resource and Equipment Management, supported by technicians and staff responsible for resources and equipment management. Regular maintenance prevents unexpected breakdowns, reduces downtime, and minimizes costly emergency repairs. It also ensures compliance with safety regulations, creating a safer working environment for employees and visitors. By maintaining optimal performance of all systems and equipment, organizations can achieve higher productivity and reduce energy consumption, contributing to cost savings and environmental sustainability. Allocating a budget for maintenance is essential to prevent unexpected breakdowns and costly emergency repairs, ensuring the continuous and efficient operation of facilities and equipment.

The total maintenance cost is estimated to be 2% of the total construction cost per building per year. The detailed breakdown of annual maintenance costs based on category and activities is presented in the following table. In Table 3.4, we divide the maintenance cost into five categories, i.e., labor costs, material and supplies costs, service and contract costs, utility costs, facility maintenance costs, and administrative costs. The detailed maintenance activities of each category are described below:

- Labor costs may include salaries and wages of maintenance staff, including technicians, custodians, and supervisors.

- Materials and supplies include spare parts and components for equipment repairs, consumables materials, and tools and equipment for maintenance staff.
- Contracted services include costs for external contractors for specialized repairs and maintenance tasks, for inspection and testing of equipment and systems, and for contracted cleaning services for facilities.
- Utilities and energy costs include operational costs such as consumption for lighting, HVAC, equipment operation, costs for water supply and sewage services, and fuel costs.
- Facility maintenance costs include costs for structural repairs, painting, renovations, groundskeeping, safety, and compliance upgrades.
- Administrative costs include costs for maintenance management software and other related software tools, office supplies, and communication.

Table 3.4 Annual maintenance cost estimated for each building per year

Category	Cost (IDR)	Cost (JPY)
A. INNOVATION ECOSYSTEM ZONE	**1,437,000,000.00**	**13,966,371.85**
Labor Costs	766,000,000.00	7,444,844.01
Material and Supplies Costs	110,000,000.00	1,069,102.93
Service and Contract Costs	150,000,000.00	1,457,867.63
Utility Costs	216,000,000.00	2,099,329.38
Facility Maintenance Costs	150,000,000.00	1,457,867.63
Administrative Costs	45,000,000.00	437,360.29
A. INNOVATION ECOSYSTEM ZONE	**1,327,502,406.84**	**12,902,151.88**
Labor Costs	707,631,763.15	6,877,556.26
Material and Supplies Costs	101,618,138.31	987,638.63
Service and Contract Costs	138,570,188.61	1,346,779.95
Utility Costs	199,541,071.59	1,939,363.12
Facility Maintenance Costs	138,570,188.61	1,346,779.95
Administrative Costs	41,571,056.58	404,033.98
Total Maintenance Cost	**2,764,502,406.84**	**26,868,523.73**

3.2.2 Project Implementation Unit (PIU)

The Project Implementation Unit (PIU) is the core structure responsible for the successful execution of the project. As shown in Figure 3.6, the PIU operates under the leadership of the Project Coordinator, Project Director, Project Manager, and Project Secretary, with specialized units focusing on administration, finance, technical execution, and procurement.

The **Project Coordinator** is the overall person in charge of the project implementation. They coordinate the project implementation and the steering committee meetings, ensuring alignment with project goals and objectives. As the authorized budget user, they ensure proper allocation and use of project funds. The **Project Director** serves as the daily executor of the executing agency, facilitating coordination within the PMU. They formulate the work plan and project activity program, prepare regular technical reports related to project implementation, and report them to the executing agency. The Project Director oversees project activities from preparation to post-implementation, provides advice, and is responsible for the activities of the project manager and all units under the PMU, with the assistance of donor agencies. They verify and approve all documents related to project implementation and actively communicate with donor agencies and other relevant institutions. Additionally, the Project Director allocates and distributes project funds, especially those managed by the project manager.

The **Project Manager** ensures adherence to timelines, cost efficiency standards, and targets, complying with all applicable laws, regulations, and donor agency procedures. They are directly responsible to the Project Director, coordinating with technical coordinators and work units under their supervision regarding project preparation and implementation. The Project Manager supervises the project in accordance with the donor agency's standard procedures, with the assistance of management and supervision consultants. The **Project Secretary** organizes secretarial activities at the ITK PMU, coordinates the organization of meetings, and manages weekly and monthly reports.

The **Administration Unit** prepares the budget report for program activity implementation, monitored along with the program activities, with the assistance of management and supervision consultants. They are responsible for project correspondence, preparing project reports, and developing the project equipment needs plan. Additionally, they create the plan for staffing requirements. The **Financial Unit** is responsible for all activities related to the financial/budget management of the project. They handle estimates and projections of fund usage and payments during project implementation, with the assistance of management and supervision consultants. The Financial Unit assists the director in preparing financial reports for relevant institutions and the donor agency. They also evaluate and approve all invoices submitted by contractors, consultants, and suppliers and forward them to the Ministry of Finance according to standard payment procedures. The **Technical Unit** develops the technical implementation plan for the project area under their responsibility and is responsible for the execution of work in that area. They coordinate and provide regular reports to the project manager, particularly regarding the implementation and progress of the work program.

The **Procurement Unit** assists the commitment maker in project tender activities. During the tender process, a tender committee consisting of a chairperson, secretary, and members is selected to conduct tender evaluations, pre-qualifications, tenders/bidding, and contracts for the procurement of consultants, contractors, and suppliers. They prepare all tender documents in coordination with the administration department, which are then submitted to the project manager for approval. The Procurement Unit also creates a list of all project needs/requirements, including technical specifications, equipment, system installation, and maintenance. They develop standard operating procedures for all technical equipment, with the assistance of management and supervision consultants and selected suppliers.

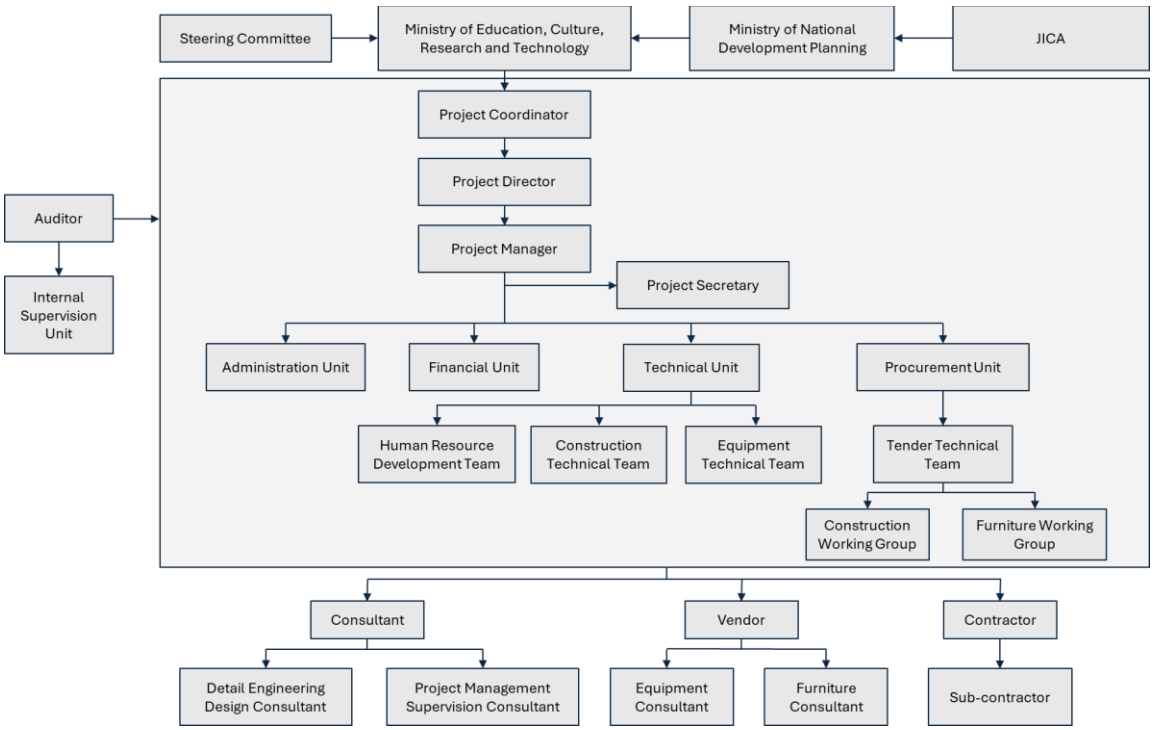


Figure 3.6 Organization structure of the Project Implementation Unit (PIU)

External support and oversight play a crucial role in the project's success. The **Steering Committee**, comprising representatives from the **Ministry of Education, Culture, Research and Technology**, the **Ministry of National Development Planning**, and **JICA (Japan International Cooperation Agency)**, provides strategic guidance and ensures the project aligns with national development goals and donor agency requirements. **JICA**, as the donor agency, provides financial and technical support, collaborates closely with the PIU, and offers technical assistance and consultancy services. The **Auditor** independently reviews and assesses the project's financial records, ensuring transparency, accountability, and compliance with

applicable laws and regulations. The **Internal Supervision Unit** oversees internal control mechanisms, monitors progress, identifies potential risks, and implements corrective actions.

Consultants provide specialized expertise in areas such as detailed engineering design, project management supervision, and equipment consultancy. They assist the PIU in planning, executing, and monitoring project activities. **Vendors** supply the necessary equipment and materials required for the project's implementation, working under the supervision of the PIU and consultants to ensure timely and quality delivery. **Contractors** and **sub-contractors** are responsible for the actual construction and implementation of the project's infrastructure. Engaged through a competitive tendering process managed by the Procurement Unit, contractors execute the construction work according to the project's technical specifications and timelines. Contractors may employ sub-contractors to carry out specific tasks or specialized activities within the project.

3.2.3 Roles and Responsibilities of Key Stakeholders

Science Techno Parks (STP) involve various stakeholders, each with specific roles. These stakeholders collaborate to create an ecosystem that supports innovation, economic growth, and sustainable development. Here are the main stakeholders and their respective roles and responsibilities:

1. **Institut Teknologi Kalimantan (ITK)**: ITK is responsible as the owner of the STP for conducting research and development in innovative scientific fields, including providing resources for innovation and technology development. Additionally, ITK must collaborate with industry and local governments to commercialize research findings.
2. **Government**: As policy-makers, the government can enforce policies and regulations that promote innovation and technological advancement. Additionally, the government can facilitate infrastructure development and provide essential services to support the operation of the STP.
3. **Industry:** Industry plays a role as an economic driver and technology user by investing in research and development projects within the STP. Furthermore, industry collaborates with academics and the government to bring innovations to market, thereby enhancing the commercialization of STP products.
4. **Community**: The community, as beneficiaries and feedback providers, supports and engages in STP activities through participation in public events, educational programs, and community initiatives. The community also provides feedback and support for STP activities and developments and benefits from job opportunities and economic growth generated by the STP.
5. **Media**: The media acts as an information disseminator and public opinion shaper by spreading information about innovations, developments, and activities at the STP. The media helps increase public awareness and supports STP marketing campaigns, as well as providing a platform for discussion and information sharing among stakeholders.

3.2.4 Partnerships and Collaboration Mechanisms

The process of forming partnerships and collaborations, as outlined in Figure 3.7, begins with the **Initiation of Collaboration**. This initial step involves identifying potential partners and reaching out to them with a proposal for collaboration. The outreach can be conducted through various means such as formal invitations, meetings, or networking events. The primary goal at this stage is to gauge interest and align the goals of the involved parties.

Following the initiation, an **Expression of Interest** is sought from the potential partners. If the proposed partners are not interested, the process halts. However, if they are interested, both parties move forward to the next step. The next phase involves a **Discussion of Cooperation Details**, where detailed talks are held to define the scope and nature of the collaboration. Both

parties share their expectations, goals, and available resources. This phase is crucial for establishing clear terms of cooperation, including roles, responsibilities, timelines, and desired outcomes. Once these details are ironed out, an **Agreement on the Collaboration** is reached, or the decision is made to not proceed if consensus cannot be achieved. If an agreement is reached, the collaboration moves forward to ensure all parties are aligned and committed.

The next step is to **Check for Existing MoU (Memorandum of Understanding)** between the parties. If no MoU exists, a new MoU is drafted and signed, outlining the general terms of the partnership and establishing a formal relationship. If an MoU already exists, the parties proceed directly to the next phase. In the **Discussion of Project Collaboration Details**, the focus shifts to specific projects under the collaboration. This involves drafting an Implementation Agreement (IA) that defines the project objectives, methodologies, deliverables, timelines, resource allocation, and performance metrics. Once the draft IA is prepared, it undergoes a review process in the **Agreement on the Draft** stage. Both parties examine the document, provide feedback, and, if necessary, make revisions. The final IA is approved and signed, marking the formal commitment to the project.

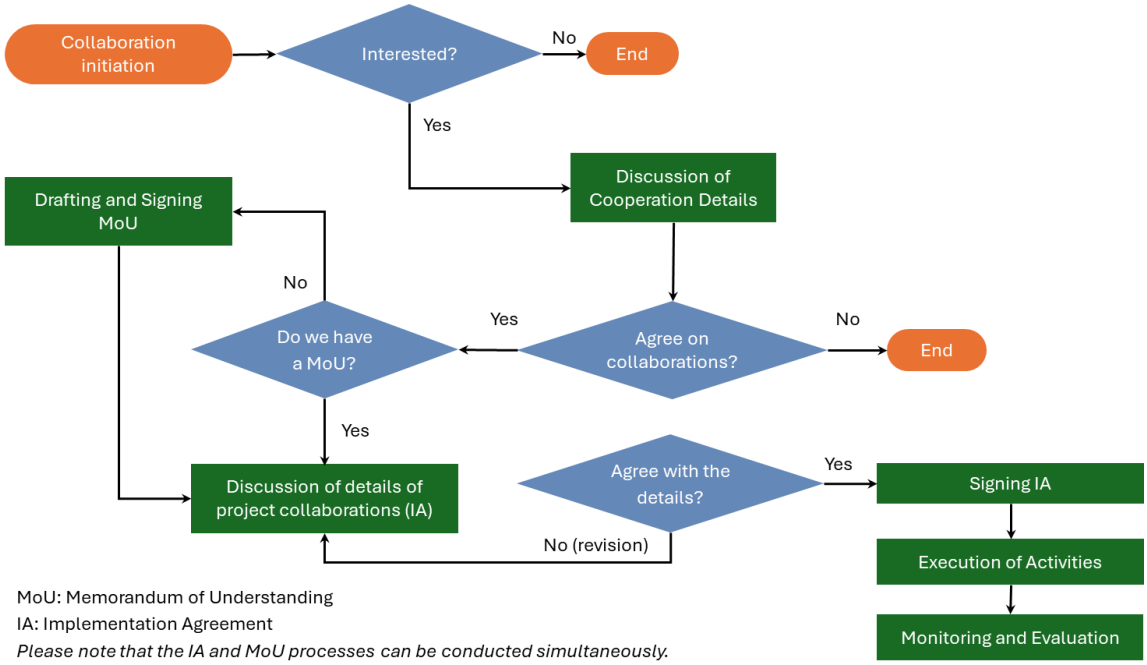


Figure 3.7 Collaboration mechanism

The **Execution of Activities** follows, where the agreed-upon projects are implemented according to the planned schedule and terms. This phase involves active participation and coordination between all parties to achieve the set objectives. Throughout the project, **Monitoring and Evaluation** are conducted to ensure that the activities are progressing as planned. Performance is measured against the agreed-upon metrics, and necessary adjustments are made to keep the project on track. This step ensures accountability and continuous improvement.

By adhering to these structured mechanisms, the collaboration and partnership process is made transparent, efficient, and effective, leading to successful and mutually beneficial outcomes. This structured approach helps manage expectations and deliver results that align with the goals of all involved parties.

3.3 Project Cost

3.3.1 Project Cost Summary

The table presents the estimated costs for the development of the Science and Technology Park (STP) at ITK, divided into two main areas: the Technology Clusters Zone and the Innovation

Ecosystem Zone. The Technology Clusters Zone covers several specialized fields, including Renewable Energy, ICT for Smart City, Food Innovations and Agricultural Technologies, Sustainable Infrastructures and Maritime Technologies, and Manufacturing and Green Industries. Each field is allocated specific costs for buildings, equipment, training and fellowship, and scholarships, with the grand total calculated by summing these components.

The total estimated cost for the Technology Clusters Zone is IDR 455,388,473,300, while the Innovation Ecosystem Zone is estimated at IDR 240,228,460,977. The combined grand total for the entire STP development is IDR 695,616,934,278. This budget covers various infrastructure and equipment needs, along with training and scholarship programs to support the development and implementation of these technological innovations. The significant investment reflects the ambitious scope of the STP project, aiming to advance research and innovation capabilities in these critical areas.

Table 3.5 Project cost summary

STP Building	Space (m2)	Estimated Cost (IDR)					
		Building	Equipment	Training and Fellowship	Total (JICA)	Scholarship (LPDP)	Grand Total
		1	2	3	4=1+2+3	5	6=4+5
Technology Clusters Zone	7,531.9	190,719,911,844	230,802,975,300	43,499,338,857	465,022,226,001	29,889,545,000	494,911,771,001
• Renewable Energy		0	41,340,093,511	8,699,867,771	50,039,961,282	5,977,909,000	
• ICT for Smart City		0	51,244,731,371	8,699,867,771	59,944,599,142	5,977,909,000	
• Food Innovations and Agricultural Technologies		0	50,505,913,081	8,699,867,771	59,205,780,852	5,977,909,000	
• Sustainable Infrastructures and Maritime Technologies		0	30,949,277,746	8,699,867,771	39,649,145,517	5,977,909,000	
• Manufacturing and Green Industries		0	56,762,959,591	8,699,867,771	65,462,827,363	5,977,909,000	
Innovation Ecosystem Zone	8,002.5	176,187,294,366	51,027,205,750	7,036,051,861	234,250,551,977	5,977,909,000	240,228,460,977
TOTAL COST	15,534.4	**366,907,206,210**	**281,830,181,050**	**50,535,390,719**	**699,272,777,979**	**35,867,454,000**	**735,140,231,979**
COST PERCENTAGE		**49.91%**	**38.34%**	**6.87%**	**95.12%**	**4.88%**	**100.00%**

3.3.2 Japanese ODA Loan Portion

The Japanese Official Development Assistance (ODA) loan provided by the Japan International Cooperation Agency (JICA) will finance a substantial portion of the ITK Science Techno Park project. According to the uploaded table, the total cost covered by JICA is IDR 659,749,480,278, which represents approximately 94.8% of the total project cost. This funding will cover expenses related to building construction, equipment procurement, and training and fellowship programs. In addition to JICA's contribution, the Indonesia Endowment Fund for Education (LPDP) will finance the scholarship portion of the project, amounting to IDR 35,867,454,000. This represents around 5.2% of the total project cost. The LPDP funding is specifically allocated for scholarships to support the development of human resources, including training and educational opportunities within the Science Techno Park.

Together, the contributions from JICA and LPDP provide a comprehensive financial foundation for the project, enabling the establishment and operation of advanced research and innovation facilities at ITK. The precise allocation of these funds will be managed to ensure efficient and effective utilization, aligning with the project's goals and timelines.

3.3.3 Annual Fund Requirement and Disbursement Method

The annual fund requirement for the STP project is determined based on the projected costs outlined in the budget summary. This includes allocations for building construction, equipment acquisition, training programs, and operational expenses. The funds will be disbursed annually in accordance with the project’s timeline and milestones. The disbursement method involves an initial payment to cover startup costs, followed by periodic disbursements based on the achievement of predefined project stages and deliverables. This phased approach ensures that funds are used efficiently and that the project stays on track. The project management team will closely monitor expenses to adhere to the budget, and adjustments will be made as necessary to accommodate any unforeseen costs or changes in project scope.

3.4 Financial Sustainability Plan and Revenue Generation

The financial sustainability of the STP is crucial for its long-term success. The revenue generation strategy includes several streams:

1. **Technology Transfer and Licensing**: Revenue will be generated through the licensing of technologies developed within the STP. This includes intellectual property rights management, patent filings, and commercialization agreements with industry partners.
2. **Service Fees**: The STP will charge fees for various services, including the use of laboratory facilities, technical consulting, and participation in training and incubation programs. These fees will be structured to cover operational costs while remaining competitive and accessible to startups and SMEs.
3. **Partnerships and Collaborations**: Strategic partnerships with industries, government agencies, and international organizations will provide additional funding and resources. These collaborations can include joint research projects, funded by external grants and contributions from partners.
4. **Government and Private Grants**: The STP will actively seek grants from both governmental and private sources to support specific projects and initiatives, particularly in areas of strategic importance such as renewable energy, ICT, and agricultural technologies.
5. **Direct Product Sales**: The STP will engage in the direct sale of products developed within its facilities. This includes commercializing prototypes and products emerging from research and development activities. These products may include technological devices, agricultural innovations, or specialized materials. Direct sales provide a significant revenue stream, leveraging the STP's innovations to meet market demands.
6. **Alumni and Industry Donations**: Building a network of alumni and industry stakeholders who can contribute to the STP's funding through donations and sponsorships will also be a key aspect of the financial sustainability plan.

The financial model will be reviewed regularly to ensure that the STP remains financially viable. This includes adjusting revenue strategies in response to market changes and exploring new funding opportunities. The goal is to achieve a balance between generating sufficient revenue to support operations and maintaining the accessibility and affordability of the STP's services for its users.

CHAPTER 4
IMPACT ASSESSMENT AND SCHEDULE

4.1 Expected Impacts

The development of a Science Techno Park (STP) at ITK is anticipated to significantly impact the region across economic, social, and environmental dimensions. This initiative aligns with broader goals of fostering innovation, technology transfer, and sustainable development, creating a multifaceted influence that can propel the local community and economy forward. **From an economic perspective**, the establishment of an STP at ITK is poised to be a catalyst for regional economic growth. The STP will attract investment from both public and private sectors, driving the creation of new businesses and industries. This influx of capital is expected to stimulate job creation, reduce unemployment rates, and raise the standard of living in the area. By fostering an environment conducive to startups and tech-based enterprises, the STP will support the commercialization of research and innovation. This commercialization can lead to the development of high-value products and services, enhancing the competitiveness of local businesses on a national and international scale.

Moreover, **the social implications** of developing an STP at ITK are equally profound. The park will serve as a center for education and skill development, providing students, researchers, and professionals with access to cutting-edge facilities and resources. This access will enhance educational outcomes and foster a culture of continuous learning and innovation. By bridging the gap between academic research and practical application, the STP will equip individuals with the skills needed to thrive in a rapidly evolving technological landscape. Furthermore, **the environmental impact of the STP at ITK will be guided by principles of sustainability and eco-friendly practices**. The park's design and operations are expected to incorporate green building technologies, energy-efficient systems, and sustainable resource management practices.

4.1.1 Economic

The expected impact of developing STP at ITK on the local economy is multifaceted, with significant potential to bolster economic growth, innovation, and societal benefits. From an economic perspective, establishing an STP at ITK can serve as a catalyst for regional development, particularly in supporting the new capital city, Ibu Kota Nusantara (IKN). The impacts of STP on economic development are:

1) Stimulating job creation.
2) Enhancing the local economy by fostering innovation and entrepreneurship.
3) The economic impact extends to the enhancement of human capital.

The STP will play a crucial role in driving economic growth and improving the quality of life in the region by creating jobs, fostering innovation, attracting investment, and supporting the development of Ibu Kota Nusantara.

4.1.2 Social

The expected social impact of developing an STP at the Institut Teknologi Kalimantan (ITK) on the local community is substantial, offering numerous benefits that extend beyond economic gains. This initiative is poised to enhance the social fabric by fostering education, improving quality of life, and supporting the development of IKN. The impacts of STP on social development are:

1) The establishment of an STP will greatly enhance educational opportunities for the local population.

2) Partnerships between the STP and local schools can lead to the development of specialized training programs and internships, which offer students hands-on experience and practical knowledge.

3) Improving the quality of life for the local community.

4) Leading to greater social cohesion by promoting collaboration between diverse groups, including academics, industry professionals, and residents.

By enhancing educational opportunities, improving quality of life, supporting the development of Ibu Kota Nusantara, and promoting social cohesion, the STP will play a vital role in enriching the social landscape and fostering a thriving, inclusive community.

4.1.3 Environmental

The expected environmental impact of developing a Science Techno Park (STP) at ITK holds significant promise for both the local community and the broader region, especially in supporting the development of IKN. This initiative can lead to substantial environmental benefits by promoting sustainable practices, advancing green technologies, and enhancing environmental awareness. The impact of STP in environmental development are:

1) The establishment of an STP at ITK can promote the adoption of sustainable practices within the region.

2) Serving as a catalyst for the advancement of green technologies.

3) Enhancing environmental awareness and education within the local community.

By promoting sustainable practices, advancing green technologies, supporting the development of Ibu Kota Nusantara, and enhancing environmental awareness, the STP will play a crucial role in fostering a more sustainable and environmentally conscious society.

4.2 Implementation Schedule and Milestones

The implementation schedule and milestones for the STP at ITK outline a strategic approach. Through careful planning and execution, the STP will become a hub of innovation, education, and sustainability, driving regional development and setting a standard for similar initiatives globally. By focusing on these key milestones, the project ensures a balanced and inclusive growth trajectory, fostering a resilient and prosperous community.

The project outlined in Table 4.1 is a multi-year initiative that spans from 2026 to 2030. It is planned to ensure the successful establishment of a Science Techno Park (STP). The timeline is divided into distinct phases—each focusing on different aspects of the project, such as planning, construction, equipment procurement and installation, and the development of human resources and software. The sequential nature of the activities ensures that each phase builds on the previous one, contributing to the overall success of the project.

The project begins in 2026 with initial planning and team preparation. This phase, lasting the entire year, is critical as it lays the foundation for the subsequent phases. Spanning 12 months, this phase involves assembling the core project team and securing essential approvals. The completion of the preliminary project plan is the key milestone of this phase, ensuring that all necessary preparations are in place before moving forward. The thoroughness of this phase is crucial as it sets the stage for the implementation process in the later years.

Following the planning phase, the project moves into the construction phase, which spans from 2027 to 2029. The first activity in this phase involves finalizing design documents, completing the bidding process, and preparing the site for construction. This activity starts in the first semester of 2027 and extends into the second semester of 2028, lasting approximately 18 months. The successful completion of these tasks is a significant milestone, indicating readiness for the physical construction of the STP. Construction of the STP Technology Clusters Zone begins in 2028 and continues through 2029, with a project period of about 24 months. This activity focuses

on the structural completion of this zone, a critical component of the STP. By the end of this period, the Technology Clusters Zone should be structurally complete and ready for the next steps in operational setup. Concurrently with the Technology Clusters Zone, the Innovation Ecosystem Zone is also constructed during the same period, also lasting around 24 months. This zone is essential for fostering innovation within the STP. The structural completion of this zone marks a significant milestone, paving the way for operational readiness and further development.

Table 4.1 Implementation Schedule and Milestones

No	Implementation Agenda	2026		2027		2028		2029		2030		Milestone
		1	2	1	2	1	2	1	2	1	2	
1	Initial planning and team preparation											Completion of the preliminary project plan, securing necessary approvals, and assembling the core project team
Construction												
2	Design, bidding, site preparation											Finalization of design documents, successful completion of bidding process, and site readiness for construction
3	Construction of STP Technology Clusters Zone											Structural completion of STP Technology Clusters Zone and start of facility setup for operational readiness
4	Construction of STP Innovation Ecosystem Zone											Structural completion of STP Innovation Ecosystem Zone and start of facility setup for operational readiness
Equipment												
5	Listing of equipment, specifications, and supplier											Finalized list of required equipment, confirmed specifications, and selected suppliers.
6	Bidding											Successful procurement of all required equipment
7	Installation											Complete installation of equipment in designated zones and ready for testing
8	Equipment training											Completion of staff training on the use and maintenance of installed equipment
Software/Human Resource Development												
9	Candidate selection											Successful recruitment and onboarding of qualified candidate
10	Training											Completion of training programs
11	Fellowship											Completion of fellowships
12	Degree studies (Masters and PhD)											Enrollment of candidates into degree programs and initiation of research projects aligned with STP objectives

The Equipment Phase runs parallel to the construction activities, focusing on procurement, installation, and training related to the STP's equipment. Starting in 2027 and continuing into 2028, this activity spans approximately 18 months and involves creating a finalized list of required equipment, confirming specifications, and selecting suppliers. This is a critical step, ensuring that all necessary equipment is identified and ready for procurement. The procurement process takes place from the second semester of 2028 through the first semester of 2029, lasting about 12 months. Successful bidding and procurement of all required equipment are essential milestones, ensuring that the project has all the tools necessary for the next steps in installation and testing. Once the equipment is procured, the installation process begins, starting in late 2029 and continuing into 2030, over a period of approximately 12 months. After installation, staff training on the use and maintenance of the equipment is conducted. This phase concludes with the equipment being fully installed, tested, and the staff prepared to operate it, ensuring that the STP is ready for full operational deployment.

In parallel with the physical construction and equipment phases, the project also focuses on human resources and software development, critical for the STP's successful operation. Starting from the first semester of 2026 and extending through the second semester of 2027, this phase involves the recruitment and onboarding of qualified candidates, lasting about 18 months. Successful recruitment is a significant milestone, ensuring that the STP has the necessary human resources to proceed with the next phases. Following recruitment, the focus shifts to training these candidates. This phase, occurring from 2027 to 2028, spans approximately 18 months and is essential for ensuring that the staff is fully prepared to take on their roles within the STP. The completion of training programs is a key milestone, ensuring operational readiness. In addition

to training, there is an emphasis on long-term human resource development through fellowships and degree studies, starting in 2027 and continuing through 2030, with the program lasting about 48 months. This activity aims to enroll candidates into degree programs and initiate research projects aligned with the STP's objectives. By the end of this period, the STP will have a well-prepared workforce, equipped with advanced knowledge and skills to drive innovation and development within the park.

The project’s timeline is structured to ensure that each phase builds on the last, with clear milestones marking the completion of critical tasks. By the end of 2030, the Science Techno Park is expected to be fully operational, with state-of-the-art facilities, equipment, and a well-trained workforce ready to contribute to innovation and economic development. This phased approach ensures that the project remains on track while allowing for adjustments and improvements as needed, facilitating the successful realization of the STP's objectives.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Key Findings and Recommendations

The establishment of the Science Techno Park (STP) at Institut Teknologi Kalimantan (ITK) has been planned to serve as a central hub for technological innovation, research, and industry collaboration in Kalimantan. The STP aims to support the regional development goals of enhancing economic growth, fostering sustainable practices, and building a skilled workforce. Key findings from the project include the potential for significant economic impact through job creation, business incubation, and technology commercialization. The STP is also positioned to play a crucial role in addressing regional challenges, such as environmental sustainability and infrastructure development. Recommendations for the STP and ITK include:

1. **Strengthening Industry Partnerships:** Establishing strong partnerships with local and international industries to facilitate technology transfer and commercialization.
2. **Focusing on Sustainable Development:** Prioritizing sustainable practices in all STP activities, including the development of green technologies and promoting eco-friendly innovations.
3. **Enhancing Human Capital:** Providing comprehensive training and educational programs to build a skilled workforce capable of supporting high-tech industries.
4. **Expanding Research Capabilities:** Continuously enhancing the research productivity, especially increasing the number of publications and patents, as well as improving the infrastructure to support advanced studies in emerging technologies.
5. **Securing Long-term Financial Sustainability:** Implementing a diversified revenue generation strategy, including service fees, partnerships, and direct product sales, to ensure the financial viability of the STP.

5.2 Call to Action and Next Steps

To realize the full potential of the STP, immediate actions are necessary. These include finalizing partnerships with key industry players, securing additional funding sources, and initiating the construction of the STP facilities. It is also crucial to engage with local communities and stakeholders to foster a supportive ecosystem for innovation and entrepreneurship. The success of the STP will depend on the collective efforts of academia, industry, government, and the community. We call on all stakeholders to actively participate in this transformative initiative, which promises to bring lasting benefits to East Kalimantan and Indonesia as a whole. The next steps involve the implementation of the detailed project plan, continuous monitoring and evaluation, and adaptive management to ensure that the STP meets its objectives and delivers value to all stakeholders.