



## The Long Journey of Indonesian Science and Technology Policy during the New Order Period (1968–1998)

Maulana Akbar <sup>a</sup>, Syifa Naufal Qisty<sup>b</sup>, Veni Robiatal Adawiyah<sup>c</sup>, Wisnu Mahardhika Putera<sup>d</sup>

<sup>a</sup>Directorate of Research and Innovation Policy, BRIN, Indonesia

e-mail: [maulana.akbar@brin.go.id](mailto:maulana.akbar@brin.go.id)

<sup>b</sup>Directorate of Repositories, Multimedia, and Scientific Publishing, BRIN, Indonesia

e-mail: [syif002@brin.go.id](mailto:syif002@brin.go.id)

<sup>c</sup>Directorate of Research and Innovation Partnership, Indonesia

e-mail: [veni002@brin.go.id](mailto:veni002@brin.go.id)

<sup>d</sup>Bureau for Planning and Finance, BRIN, Indonesia

e-mail: [wisn008@brin.go.id](mailto:wisn008@brin.go.id)

### ARTICLE INFO

#### Article History:

Received : 5 November 2022

Revised : 10 December 2022

Accepted : 11 December 2022

Available online : 15 December 2022

#### Authorship Contribution:

All authors have equal contributions as the main authors

#### Keywords:

S&T Policy,

New Order,

S&T Development,

Repelita

### ABSTRACT

This study examined Indonesia's science and technology (S&T) policies from 1966 to 1998. The study investigated how the government identifies S&T problems, plans policies, and implements policies to support S&T development using the primary source of national development planning, the six-volume of Five-Year Development Plan (Repelita). A literature review with a historical approach was used to conduct this research. A descriptive analysis of discourse data was carried out systematically. According to the study, during the 32-year New Order regimes of Indonesian S&T policy, the focus of development shifted from agriculture to efforts of transition mastery in technology products through the development of Human Resources in Science and Technology (HRST), institutional development of S&T, implementation of S&T culture in government institutions, provision of S&T for industry, and technology transfer. Although Indonesian S&T development has never reached a point where it can compete with developed countries, it does contribute to the creation of a foundational S&T ecosystem, particularly as the first step in the establishment of the following regime.

\* Corresponding Author.

E-mail: [maulana.akbar@brin.go.id](mailto:maulana.akbar@brin.go.id)



## I. INTRODUCTION

Indonesia has a long and dynamic development policy led by President Suharto in a regime known as the New Order. As a country still recovering from colonialism and has problems on multiple levels, it is natural for the government to require policy guidelines to determine which priorities it wishes to address. Long-term planning will cover these in twenty years. In the medium term, the People's Consultative Assembly of the Republic of Indonesia (MPR RI) drafted a Broad Outlines of the Nation's Direction (GBHN) to guide policy on national strategies developed every five years. Later, GBHN is translated into technical planning in a Five-Year Development Plan, referred to in this paper as 'Repelita,' an acronym in Indonesian.

Repelita addresses a broad range of development policies. One is the science and technology (S&T) policy, which has always been on the Repelita development agenda. After Indonesia was preoccupied with political and economic instability under President Soekarno's rule, the New Order Regime launched its S&T policy with a small initial investment. Colonialism left behind research institutions and systems, and few indigenous Indonesian college graduates result from the colonial government's discriminatory policy (Akbar & Handayani, 2021; Gross, 2011). On the other hand, the previous regime did not provide sufficient sources and ideal policies as the initial foundation for S&T development. As a result, the role of S&T was uneasy at the start of the New Order. As a result, other sectors, such as agriculture, contributed significantly to national development.

Even within the same regime, each period of government usually has a different policy focus and actors in developing S&T over long decades (Oktavianti et al., 2013). Most historical research examines Indonesian policy trends from the perspective of the economic sector and development (Akrasanee, 1981; Booth, 1995; Cheok, 1980; Kintanar Jr, 1984; Yue, 1978). Besides, agriculture as the development sector contributed the most, frequently being the primary research subject throughout the New Order Regime period (Darusman, 1997; Nurin et al., 2020; Simatupang

et al., 1999; Tambunan, 1998). However, only some witnessed the advancement of science and technology during that period. As a result, this study will fill a void by examining the direction of S&T policy from Repelita as development planning, identifying the actors involved, and implementing in the form of legal guidelines published by the government as planning feedback. This paper will consider Repelita as 'the scripture' of S&T policies posted during that period and will link Repelita to policies issued in a single interconnected network. The questions to be answered are how the problem in the period can be addressed in Repelita and solved correctly through the S&T policy implementation. This paper divides the entire New Order regime into eight pre-Repelita parts and seven Repelita series to make the differences more visible.

## II. ANALYTICAL FRAMEWORK

No one consensus defines "public policy" in one absolute meaning. In the broadest context, Dye (2017) argues that a public policy is a decision made by the government to do something or not. However, decision-makers should ensure that all processes and policies must be based on public issues (Cochran & Malone, 2005). The products of public policy also have various forms. Birkland (2015) commonly assumes that a policy is not only a legal product in the form of laws and regulations but also the leadership and behaviour of government officials at all levels. This shows that public policy cannot be seen from the results in the form of laws but also in the process of making laws, including how the government formulates problems and makes plans in policymaking.

As for the legal point of view, there are two common types of countries making a law. Nugroho (2014) assesses a country as continentalism or anglo-saxonism. Continentalism regards policy as a product of one-way law, whereas anglo-saxonism regards policy as a shared process between government and society. It can be seen as European countries tend to be continentalist, while the United States is Anglo-Saxonist. Indonesia is on a continental understanding because of the Dutch Bureaucracy's legacy, which is centred on the kingdom's interests.

In a continental country, policies are made stratified from the most common macro policies, intermediate in the form of meso policies, and operational policies or micro policies (Aizawa & Rose, 2019; Nugroho, 2014). Macro policies refer to laws and government regulations. In contrast, meso policies are in the executive realm, such as ministerial regulations and micro policies are in the realm of the executive and implementing agencies. The three policy levels are not specific points of view. Miller and Demir (2007) consider that macro-meso-micro typologies are commonly used in addition to sectoral and sub-sectoral typologies. Furthermore, Hill and Hupe (2002) argue that the domain of macro policy belongs to the realm of the national system, while in practice, relations between institutions are in the meso and micro dimensions.

This is evident when looking at the policies that must be regulated in careful and comprehensive planning because they involve many stakeholders and cross sectors from macro to micro levels. National planning and development are inextricably linked. Several meanings of development can be seen from theoretical and practical perspectives. According to Subkhan (2014), the conceptualisation of development is emphasised more on the strategy than the theoretical side.

### III. METHODOLOGY

The method used in conducting this study is the literature with a historical approach. This method is used as a guideline for conducting historical research and its problems or instruments to reconstruct historical events (history as part actuality) into a story (history as written). Evidence supporting facts is collected, evaluated, verified, and synthesised to obtain firm conclusions. Thus, the relationships between man, events, time, and place are obtained chronologically as a whole and do not look at the pieces of the observed objects. According to Hamzah (2020), there are several main elements in conducting historical research. The process of reviewing past events, carried out systematically and objectively, is a series of integrative images of the past and cannot be done partially. The data used in historical research relies more on primary data, is searched more

thoroughly, and explores information not cited in standard reference materials.

In this study, descriptive analysis was systematically carried out through the processing of discourse data. The Repelita document is the primary reference for mapping and problems at each period. In addition, policies in the form of legal and regulatory products, such as government laws and regulations, are the primary source of the extent to which the planning is implemented.

## IV. RESULTS AND DISCUSSION

### A. Pre Repelita

After gaining independence from Dutch colonialism in 1945, Indonesia lacked adequate Human Resources in Science and Technology (HRST) to replace Dutch colonialism in S&T. According to Akbar and Handayani (2021), inclusionary education has been a failure of ethical politics. It shows that European researchers continue to dominate those involved in research, with little involvement from native Indonesians. Furthermore, research organisations were still fully controlled by the Dutch empire and used as much as possible for colonial purposes.

In other words, regardless of valuable heritage, such as higher education and the Buitenzorg labs, Indonesia began to build science and technology from scratch. The President of Sukarno's order still hampered several attempts to develop S&T. The government was preoccupied with a variety of internal conflicts as well as efforts to maintain independence from wars and internal conflicts. In the early 1950s, there was an attempt known as the 'Banteng' program to nationalise foreign companies where there were key institutions in the development of science and technology such as the Instituut Pasteur (now PT Biofarma) and the Buitenzorg Botanical Garden (now the Bogor Botanical Gardens, which is part of BRIN). Nonetheless, they could not operate all processes in these institutions in the same way that the Dutch scientists did.

In short, two trends in S&T policy have been applied as the initial foundation of S&T development in Indonesia under the Old Order Regime since the Banteng Program in the 1950s.

*The first* is the development of human resources (HR) through more inclusive education. Dissonance and discrimination in the education system during the colonial era resulted in fewer school opportunities for Indonesians than Europeans, resulting in most Indonesians having no access to formal education. The most recent survey revealed that only 10.8% of Indonesians could read the writing (Central Bureau of Statistics, 1941). Moreover, after independence in 1945, Indonesia only had 400 undergraduate college graduates (Gross, 2014). In response to the problem, the Indonesian government's initial strategy under President Sukarno was to lay the groundwork by developing policies in the education sector. As stated in the 1945 Constitution, the values of discriminatory education are changed by more inclusive education to educate the nation's life (Article 31 Paragraph 3).

At the macro level, during the 1950s, there were several central policies regulating the education sector, namely Law 4/50 about education and school teaching as a regulation of governance and implementation of education. In addition, Emergency Law 7/1950 on universities seeks to take over the colonial universities in the form of *Universitat van Indonesia*<sup>1</sup> into the hands of the Indonesian government. From that period until 1959, there was a micro-level policy to expand the number of universities in various regions of Indonesia, including Gadjah Mada University (Government Regulation 23/1949), Airlangga University (Government Regulation 57/1954), Hasanuddin University (Government Regulation 23/1956), Andalas University (Government Regulation 24/1956), PTPG (1954), Padjadjaran University (Government Regulation 37/1957), and Bandung Institute of Technology (Government Regulation 6/1959). These universities spread the opportunity for Indonesians on all sides of the country to have accessible higher education.

*Second*, the government generally focuses on developing three S&T sectors: basic science, nuclear, and aerospace. Basic science started with

the Law on establishing the Indonesian science council (MIPI). Although MIPI was formed through Law 6/1956, the committee to establish MIPI had been created by the government and Indonesian scientists one year earlier. According to Gross (2011), MIPI was formed on the committee's input to make the leading organisation a medium of national science and technology progress. In addition, MIPI will be created as an autonomous organisation that provides feedback to the government on state issues, projects, and S&T development activities. At the same time, the Atomic Energy Council & Atomic Institution was formed by Atom PP No.65 of 1958 as a follow-up to the Establishment of the State Committee for Radioactivity Investigation in 1954. One of the institute's main tasks is to provide infrastructure in nuclear power research and education for national atomic experts (Gross, 2011).

Meanwhile, the 1960s was a period of transition from the Old Order government to the New Order. In this period, the functions of assemblies and councils were raised to larger organisations in the form of institutions and state bodies, such as MIPI, which became the Indonesian Institute of Sciences (LIPI) based on MPRS Decree No.18/B/1967 in 1967, the Atomic Energy Council & Atomic Institutions which became the National Atomic Energy Agency (BATAN) based on Law No.3 of 1964, along with the establishment of the National Aeronautics and Space Agency (LAPAN) in 1963 based on Presidential Decree No. 236.

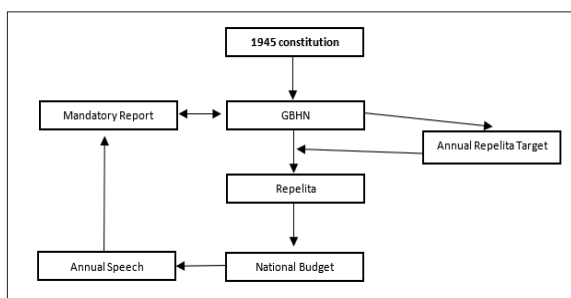
## B. Repelita

The new order under President Suharto is the longest period of one government in Indonesia's history. During this period, Indonesia experienced growth in numerous sectors due to the proliferation of government institutions with specialised functions. Ampera II Cabinet (1967–1968), Development Cabinet I (1968–1973), Development Cabinet II (1973–1978), Development Cabinet III (1978–1983), Development Cabinet IV (1983–1988), Development Cabinet V (1988–1993), Development Cabinet VI (1993–1998), and Development Cabinet VII hold the power of government for 32 (thirty-two) years (1998–1993).

<sup>1</sup> Replacing the current higher regulation of Dutch East Indies such as *Hoger Onderwijs Ordonnantie* 1946 (*Staatsblad van Nederlands Indie* 1947 No. 47) and *Universiteitsreglement* 1946 (*Staatsblad van Nederlands Indie* 1947 No. 170)

S&T policy began to gain a special place in the New Order period, such as establishing particular institutions to handle the field of S&T, namely the Indonesian Institute of Sciences (LIPI) and the Agency for the Assessment and Application of Technology Indonesia (BPPT). Furthermore, in 1967 research became an ideal place when the Ministry of Research and Technology began to be established to carry out research functions that have become increasingly complex. At that time, Indonesia had gone through a long period of colonialism, and domestic conflicts began to see S&T as an important sector to be planned well.

Generally, policy and its direction as a result of state law are reflected in reference documents like the State Direction Outline (GBHN). Article 3 of the Constitution of 1945 mandates the presence of GBHN by the People’s Consultative Assembly. On July 5, 1959, the Presidential Decree that inaugurated the era of democracy under the leadership of President Sukarno made GBHN a reality. The National Council of Planning (Dapernas) was established and subsequently transformed into the National Development Planning Agency (Bappenas). Technically, the GBHN is relegated to a five-year plan that addresses various sectors in Repelita (as in Figure 1). Repelita’s policy direction is derived from a set of long-term planning (PJP) based on the Constitution of 1945. In implementing the State Budget and as outlined in the President’s Annual Address, additional activities pertaining to Repelita’s recommendations were undertaken.



Source: Bappenas, as cited in Subkhan (2014)

Figure 1. The Development Planning Cycle in Indonesia (1969–2018)

The long-term growth of Repelita has resulted in the presentation of various Indonesian processing development stages. Table 1 demonstrates how Repelita’s objectives have progressed. Most of the primary objectives for the agricultural sector, for example, were started in the first volume. The following plan was to transition to an autonomous industry by processing raw materials into raw products and critical goods into completed goods. After Indonesia was deemed capable of producing finished items, the policy focus shifted to manufacturing machinery for both heavy and light sectors. Following an improved industrial ecosystem, the volume of Repelita ultimately concentrated on raising foreign investment to accelerate industry development. These lengthy flights will be described separately in the following discussion, particularly in the sector of S&T.

Table 1. The Development of Repelita I–VII

Long-term plan	Medium-Term Plan	GBHN	Purpose
PJP I	Repelita I	Tap MPR No. IV/MPR/1973	The agricultural sector with industries that support agrarian exports.
	Repelita II	Tap MPR No. II/MPR/1978	The agricultural sector increases the industry that processes raw materials into raw materials.
	Repelita III	Tap MPR No. IV/MPR/1983	The agricultural sector towards food self-sufficiency and increasing industries that process raw materials into finished goods. Labour-intensive Industrial Emphasis
	Repelita IV	Tap MPR No. II/MPR/1988	The agricultural sector continues efforts towards food self-sufficiency by improving industries that can produce heavy and light industrial machinery.
	Repelita V	Tap MPR No. II/MPR/1993	The agricultural sector increases the transportation, communication, and education sectors.

Long-term plan	Medium-Term Plan	GBHN	Purpose
PJP2	Repelita VI	Tap MPR No. II/MPR/1998	Economic sectors related to industry and agriculture. It improves the development of the foreign investment climate and boosts the national economy and industry.

### 1. Repelita I (1969–1974)

Indonesia's economic environment underwent extremely high inflation between 1960 and 1965. The average annual price rise is 225%. One of the factors was implementing an infinite fiscal deficit policy before 1966. Government spending increased then, but it was given to less productive enterprises with limited government financing sources.

The administration began to plan how to boost revenue while reducing the country's deficit, which was a source of inflation. The five-year program announced in Repelita is the development of industries that support agricultural exports. This is because exports of plantation agricultural products, including rubber, copra, tobacco, coffee, and pepper, have long been the country's income source. However, after hitting a low point in 1965, its development over the last ten years continued to fall and climb in 1966.

These economic challenges impact inadequate infrastructure and funding for S&T development activities, such as the lack of scientific book and magazine publishers, restricted research, high printing costs, and no addition of scientific tools since 1958. Furthermore, at the time, Indonesia lacked a foundation for industrial competence, which could have boosted the economy. As a result, during Repelita I, the government's attention to developing science and technology became the first step, mainly to satisfy basic research facilities' needs.

In the early 1970s, there was a movement in S&T policy to use more massive research in government systems. Specifically, the transfer of research matters from the Ministry of Education and Culture to the Second Development Cabinet

under the Minister of State Research (Keppres No. 45, 1973). In addition, R&D bodies were established in other departments the same year to reinforce research positions supporting the ministry's policy and operational tasks. It also advances basic sciences in industrial use and technology transfer (Presidential Decree of the Republic of Indonesia No. 45 of 1974 concerning the Department's Organizational Structure).

### 2. Repelita II (1974–1979)

The fiscal year (1973/1974–1978/1979) was dedicated to raising living standards. Repelita II's specific goal is to offer adequate food, clothing, and housing (food, clothing, and boards); improve and develop infrastructure; distribute development outcomes; and create new jobs. Repelita I has a more extensive development budget for social welfare, such as education, health, and family planning, as well as money for industrial and mining growth.

The government focused on national production outside agriculture as the industry became the most developed main sector during the Second Repelita period. Industrial development is centred on industries that convert raw materials into finished goods. GBHN is planning this, and one of the long-term development objectives is to radically restructure Indonesia's economic structure. Furthermore, the growth of Repelita I reveals an increase in industrial production, both in type and quantity. Some of Indonesia's export items are appealing and competitive in international markets. However, the government's current difficulty is determining how to manage labour-intensive industrial challenges and their distribution in large cities to achieve regional equality.

The Indonesian economy expanded significantly during this period. Not only agriculture but practically all sectors are growing at around 7%. This expansion can be seen in several critical areas, including agriculture, which has expanded by 25%, and industry, construction, finance, and government services, which have more than doubled. However, Booth (1979) does not represent a substantial increase in employment, with the manufacturing sector accounting for only 8%

of the labour force and the agricultural accounting for 62%.

The government's strategy in the sphere of S&T under Repelita II is to increase the utilisation of S&T according to national development needs. The prioritised research is applied research. To improve the focus of research activities, the government separates them according to the priority direction of development policy. Short-term research activities focus on the agricultural, industrial, and mining sectors. Long-term policy is therefore required to study population issues, natural resources, and the environment.

S&T policy in Repelita II (1974–1979) was still focused on strengthening research infrastructure. However, the growth of science and technology began to shift to more major industries, and technology transfer operations were prioritised. The government founded several institutions to aid in the development of industry and trade. Puspiptek was established on October 1, 1976, to coordinate several research and industrial needs tasks, such as standardisation and product quality control. Then, a nationwide calibration, instrumentation, and metrology system were built to verify the accuracy of production outcomes. Based on the Presidential Decree of the Republic of Indonesia No.25/197, the government also founded BPPT in 1978. This agency, managed by Prof. Dr. Ing. B. J. Habibie, is reorganising Pertamina's Aviation Technology and Technology Division (1974) and Pertamina's Advanced Technology Division (1976).

### **3. Repelita IIIc (1979–1984)**

The Second Five-Year Development Plan (Repelita II), which ran from 1974 to 1979, produced satisfactory results to serve as the foundation for the Third Five-Year Development Plan (Repelita III), which ran from 1979 to 1984. Repelita III's principal objective is to enhance all more equitable individuals' life, intelligence, and welfare. In Repelita II, however, the increase in the rate of development has not been matched by an optimal inter-regional allocation of revenue. This is consistent with the findings of Kuznets (1955), who concluded that income distribution tends to deteriorate at the onset of the growth

stage because some parties can take advantage of existing development potential. With a moderately high average economic growth rate of 7.22 percent in 1978, or the final period of Repelita II implementation, Indonesia's Gini index increased from 0.34 in 1976 to 0.38, placing it in the category of moderate inequality.

Repelita III prioritises the agricultural, industrial, and mining sectors as the primary pillars for meeting development demands. By adhering to the Outline of State Direction (GBHN), the execution of Repelita III is based on a development trinity, namely (1) equitable development and its outcomes that lead to the construction of social justice for all people; (2) sustainable development; and (3) environmental sustainability. (2) High economic growth and (3) national stability that is robust and vibrant. The principle of equalisation is then poured into eight distribution lines, namely (1) equitable fulfilment of the basic needs of many people, especially food, clothing, and shelter; (2) equitable access to education and health services; (3) equalisation of income sharing; (4) equalisation of employment opportunities; (5) equalisation of opportunities to try; (6) equalisation of opportunities to participate in the development, particularly for the younger generation; and (7) equalisation of opportunities to try.

With the same emphasis as Repelita III's primary objectives, namely the agricultural, industrial, and mining sectors, assistance from the S&T fields became one of the most crucial components for the success of Repelita III. Separated into basic and applied sciences, S&T focuses on meeting development needs. During the period of Repelita III, the development of science, technology, and statistics was hindered by the lack of a link between technology development and development needs, the suboptimal utilisation of developed research facilities, and changes in the primary goals of development that influenced changes in the types of research and statistics required for plan preparation. Since statistics were collected during a harsh and data-intensive period, this historical period is also characterised by sporadic, costly statistics.

The improvement of S&T to meet development demands is accomplished in several ways, including the development of people resources, infrastructure, and institutions. As stipulated in Presidential Decree No. 22 of 1977 on the status of researchers and the training and education programs provided to researchers, human resource development is accomplished through the career coaching of researchers. During this period, numerous Non-Ministry Government Organisation research facilities were constructed, including a nuclear laboratory for BATAN, the physical development of the Science and Technology Research Center (PUSPIPTEK), the addition of LAPAN facilities, and the LIPI Social Sciences building. Institutionally, the National Standards Council (DSN) was established in 1984 to formulate standardisation policies, implement coordination, and encourage national standardisation cooperation. On January 7, 1984, PEPUNAS Ristek was upgraded and replaced following Presidential Decree No.1/1984, which transformed PEPUNAS into the National Research Council (DRN). DRN serves as a board that assists the Minister of Research and Technology in formulating the direction and top priorities of science and technology development, as well as a non-structural coordination platform that assists the Minister of State for Research and Technology in formulating major national programs in the field of research and technology. This increase was made to bridge the gap between technology development and development requirements.

#### **4. *Repelita IV (1984–1989)***

From 1984 through 1989, the fourth five-year development plan was in effect. Repelita IV focuses on resolving concerns identified in Repelita III but not entirely resolved. This is evident in the objective of Repelita IV, which remains the same as that of the previous period: the development of the economy with an emphasis on the agricultural sector to continue efforts to increase food self-sufficiency and improve industries that can produce their industrial machinery. Increased food production and other basic needs, the increase in the ability of weak economic groups, cooperatives, population, land ownership and use, transmigration, housing, expansion of facilities

and improving the quality of education, health and nutrition services, law development, public order, environmental sustainability, and other problems in various fields have not been completely resolved.

In contrast, with the issuance of Law 5 in 1984, the industry became the primary foundation for the administration of diverse industrial sectors in Indonesia. This law addresses the development of industrial technology, engineering, and standards in addition to industry development at the macro level. Industry participants are incentivised to utilise or develop appropriate technologies to boost industrial production. Moreover, the government assumes responsibility for the transfer of technology in an endeavour to master strategic technologies.

Repelita IV adheres to the same development sequence as Repelita III and uses the same eight equalisation channels. The average rate of economic growth on Repelita IV was 5.58 percent. Nonetheless, the Gini index revealed that income inequality had dropped to 0.33 at the start of Repelita IV in 1984. Even if income inequality remains in the moderate range, it has decreased significantly since the beginning of the Repelita III period.

The results have been developed and utilised to support the attainment of Repelita IV's primary objectives in science and technology. In Repelita IV, S&T research and development is conducted following an S&T development strategy. In the short term, the development of science and technology is carried out via the direct development sector, such as the continued construction of laboratory complexes in Serpong and Rumpin in West Java, and the indirect development sector, such as an increase in the knowledge and calibre of researchers and the number of researchers. In this relationship, research institutions and research units are directed to (1) develop their new technologies and sciences where applicable for use in Indonesia; (2) develop basic sciences to enable the development of new technologies; and (3) have goals that are directly related to the societal needs.

Consequently, the policy reflects the industrialisation transformation as outlined in



Presidential Decree 44/1989 on the Strategic Industrial Development Agency, which regulates nine sectors of industrialisation transformation, namely the industry of aviation, maritime and shipping, land transportation, telecommunications, energy, engineering, agricultural tools and machinery, defence, and software. In focus on the growth of these sectors, State-Owned Enterprises became the key instrument for ignoring the results of research, as established by several SOEs that became representatives in each area, such as IPTN (1985), PT Pindad (1983), and PT INKA (1990). (1981). Some of these businesses dated back to colonialism and were nationalised under the Banteng Program. Nonetheless, the government endeavours to give a stronger position for producing new items.

In addition, obtaining a patent becomes the most important aspect of the invention in safeguarding the rights of the researcher and the technology owner. In preserving copyright and technological transfer, patent legislation 6/1989 was enacted to supplement the set of industrial policies, particularly industrial law 5/1984, which mandates patents as one of its provisions.

On the other hand, these initiatives are backed by expanding human resource capacity. At the beginning of Repelita IV in 1984, the government mandated six years of obligatory schooling, which increased to nine years in Repelita VI. Nisak (2016) argues that this approach has led to a rise in the number of new teachers and students in Surabaya, who may serve as the future supply of HRST. In addition, the number of universities rose dramatically during this period, notably private colleges. However, numerous parties subsequently condemned the presence of private colleges for continuing to offer worse educational offerings (Booth, 1999).

### **5. Repelita V (1989–1994)**

Repelita V is the final preparation stage before moving onto an advanced, equitable, prosperous, and sustainable state and society characterised by a high degree of well-being, institutions that perform effectively, and improvements in human quality and community quality. Repelita V's principal challenge is establishing, consolidating, and

enhancing progress in all spheres of national life in preparation for Repelita VI's launch.

Repelita V addressed various S&T issues, such as the absence of synergy between S&T research institutes and their relationship with development sectors, such as industry and commerce. Also below expectations is the amount of experienced, competent, and educated researchers. Therefore, this planning is intended to enhance future researcher training efforts. The synergy between research and development (R&D) institutions, universities, and the business and industrial sectors is essential and calls for greater cross-sector coordination. Cooperation is required to undertake cooperative research by enhancing the calibre of prospective researchers and leveraging existing facilities. Additionally, agency-to-agency research partnerships can boost the utilisation of university-owned laboratories. Universities have a variety of laboratories and a large number of researchers, but research possibilities and laboratory usage must be enhanced.

One of the purposes of science and technology in the Repelita V document is to create an "exciting" research climate for researchers and S&T research activities in sectors required for nation-building at the time, particularly those whose development is lagging and experts are limited. In addition to research activities, training, cultural correction of technology, the provision of information technology and scientific data, and the creation of an environment conducive to technology transfer, technology transfer efforts are conducted to support the development, utilisation, and mastery of technology. A further objective of Repelita V is to build a focused, comprehensive, and well-coordinated national research policy by enhancing scientific information network services (including libraries and archives) and research staff.

Implementing Law No. 8 of 1990 on the Indonesian Academy of Sciences is one strategy to build a national research policy (AIPI). AIPI seeks to assemble Indonesian scientists to provide advice, ideas, and considerations on their initiative and requests concerning the mastery, development, and application of science and technology to the Government and society to achieve national

objectives. AIPI arranges scientific conferences in their respective domains and initiates the formation of funds for merit-based research grants. AIPI will draft science and technology development strategies to be presented to the president to advance science and technology. In addition, the National Research Council (DRN) will increase knowledge of S&T development materials to implement more focused and integrated cross-sectoral research undertaken by researchers. This development material is adapted to the roles and responsibilities of the institution/department in question to prevent research overlap.

One of the features of the current advancement of science and technology is the intensification of international technology transfer activities. According to Habibie (1990), the Minister of research and technology at the time, the transfer of technology in Indonesia can be accomplished in four stages: a) the stage of using existing technology in the production design of new goods; b) the stage of integrating existing technologies into the production design of new goods; c) the stage of information development and the creation of technologies to design the necessary products of the future; and d) the stage of information development and the creation of technologies to design the necessary products of the future. This orientation becomes the fundamental idea material for producing technology utilising technology transfer through licensing, technology integration, technology development, and extensive basic research.

### **6. *Repelita VI (1994–1998)***

Repelita VI is planning a set of sustainability policies based on earlier Repelita accomplishments related to production engineering, technology, applied science, basic science, and the growth of S&T institutions. The primary objective of this direction is to increase the ability to utilise, develop, and master S&T. This will be accomplished by prioritising the improvement of technology transfer capabilities through technological change and renewal supported by the development of human resources, infrastructure and adequate facilities, as well as by enhancing the quality of education to support efforts to

strengthen, deepen, and expand the industry to support industrialisation towards the realisation of the realisation. To achieve these objectives, the primary set of knowledge in planning science and technology development, such as 1) Development of S&T Values, must be applied. 2) Establishing Research Partnerships 3) Continuous Improvement of Products and Production Methods 4) Enhancement of HRST Quality, Quantity, and Composition 5) Development of Science and Technology Research and Institutional Management.

During this period, the agricultural sector's contribution decreased. According to Simatupang et al. (1999), the reduction in the contribution of the agricultural sector was normal and prevalent in many developing nations at the time. However, in the case of Indonesia, the participation of the agricultural sector fell from 34% in 1971 to 19% in 1994. Therefore, Simatupang advises that the government should increase agriculture sector investment policies. This demonstrates that there was an additional contribution from other sectors, such as industry, related to the ability to master certain technologies, regardless of the agricultural issues that may have arisen at the time. Nurin et al. (2020) identified several issues on the dynamics of agricultural products in Replita VI, such as a prolonged drought, a financial crisis, and a lack of agricultural land.

After Repelita VI was confirmed as a national policy reference, the government enacted several industrial projects and policies, such as establishing the national automobile industry by Presidential Decree 2/1996, which utilises land transportation industry technologies by rebranding South Korean automobile assemblies. In addition, the completion of the N250 prototype by PT DI was the outcome of PT IPTN's founding a decade prior.

Two significant agencies, such as the Nuclear Power Supervisory Agency (Presidential Decree No. 10/1997), were established to promote atomic energy activities in Indonesia. Furthermore, the establishment of a National Standardization Agency (BSN) by Presidential Decree 13/1997 was to complement Repelita VI's goals of enhancing the quality of products and manufactur-

ing processes. Eventually, BSN became the most important factor in improving the competitiveness of Indonesian industrial actors to compete with foreign goods.

However, Repelita VI, which was supposed to be substantial momentum in the 29-year series of S&T policy that should have been completed in 1999, had to be halted in mid-1998 due to domestic political unrest that had to dethrone the New Order along with its political dominance and S&T policy ambitions.

## V. CONCLUSION

The S&T Policy carried out in the six volumes of Repelita between 1969 and 1998 is a lengthy series that has served as the foundation for developing Indonesian S&T to the present day. The findings of this study indicate that science and technology play an increasingly important role in the industrial sector of the national economy. In particular, the contribution are in two areas: the institutionalisation of S&T organisation and the provision of various legislation to assist the development of S&T.

**Table 2.**  
The Development of Repelita I–VII

No.	Year	Establishment of Science and Technology Institute
1	1945–1969	Establishment of several PTN (1949–1959) Indonesian Assembly of Sciences (1958) National Nuclear Power Agency (1958) Department of National Research Affairs (1962) National Aeronautics and Space Administration (1963) National Research Institute (1966) Indonesian Institute of Sciences (1967) Law 4/1950 on Education Emergency Law 7/1950 on Universities Law 22/1961 on Higher Education Law 31/1964 on Basic Provisions of Atom Power Law 1/1967 on Foreign Investment

No.	Year	Establishment of Science and Technology Institute
2	1969–1974	Ministry of Technology Research (1974) Ministry of R&D Agency (1974)
3	1974–1979	Center for Science and Technology Research (1976) Agency for the Application and Assessment of Technology (1978) Presidential Decree No. 22 of 1977 on Research Allowance
4	1979–1984	National Standardization Council (1984) Law 5/1984 on Industry
5	1984–1989	Presidential Decree 44/1989 on Strategic Industrial Dev. Agency Law 6/1989 on Patents Six years of compulsory education
6	1989–1994	Indonesian Academy of Sciences (1990)
7	1994–1998	Nuclear Power Control Board (1997) National Standardization Agency (1997) PP 39/1995 on Health Research and Development Presidential Decree 2/1996 on The Development of the National Car Industry

Table 2 demonstrates that the 1960s commencement of the New Order resulted in the establishment of R&D institutions with three scientific foci: atomic or nuclear power, space and aviation, and basic science. These three institutions were the backbone of the nation's science and technology when the university research function was still weak and only concentrated on the teaching function. With the Ministry of Technology and R&D founding inside the ministry in the 1970s, the institutionalisation function of R&D grew within the ministry's technical tasks. As seen by the founding of BPPT and PUSPI-PTEK, this era shifted its emphasis to research that may be directly applied to industrial users.

During the 1980s and 1990s, institutional development centred on interaction and collaboration amongst institutions to manufacture innovative goods in strategic industries. As with the common issues of Repelita V and Repelita VI, the institutional policies of this period are primarily focused on enhancing coordination and synergy between institutions to maximise

the output of institutions. During this time, the term “technology transfer” grew in popularity and influenced industrial policy. If it can be traced on one complete chronology. This study found that the growth of science and technology in Indonesia during the period of the New Order occurred in the following order:

*First*, HRST Development via Inclusive Education. During the colonial era, Europeans had greater access to education than Indonesians. Then, the discriminatory educational values evolved into an education that is more inclusive, resulting in a better human resource supply. Several major regulations exist in the education industry, such as increasing teaching governance through laws and expanding access to higher education through developing universities in various locations. There was also a trend in policy to increase the number of universities in Indonesia.

2) Innovation in S&T through an S&T institution

In the New Order era, S&T policies began to be accorded a prominent position, such as establishing numerous specialised organisations to manage S&T fields. In addition, the Ministry of Education and Culture was previously responsible for research matters, which were transferred to the Ministry of State Research. In addition to supporting the ministry’s policy and operational functions, the ministry conducts research and development.

*Second*, the institutionalisation of a culture of science and technology. The development of research activities supports plans for long-term and short-term development. The research and development (R&D) activities of the ministry are geared to address the scope of applied science and the short-term objectives of the ministry. Meanwhile, non-departmental research focuses on cross-sectoral research, national direction, and long-term research. The decision-making culture of the government is directly impacted by the presence of an R&D unit within the ministry to support the practical demands of ministerial choices, particularly in terms of evidence-based decision-making.

*Third*, the provision of S&T for Industrial industry development became a priority

throughout the era of the New Order, as seen by the documents Repelita I through Repelita VI, which always emphasise the industrial sector. Since the Repelita I period, several policies have been enacted to bridge the supply of science and technology for the industry. These include Presidential Decree 45 of 1974, Law 5/1984 on the industry, which encourages the use and creation of appropriate industrial technology to boost industrial productivity, and Presidential Decree 44/1989, which regulates the transformation of industrialisation sectors.

*Fourth*, the development of innovation and transfer technology policy. Since Repelita I and Presidential Decree 45 of 1974, an increase in technology transfer capabilities has been implemented, with Repelita V incorporating four stages of technological transformation that became the basis of Habibie’s (1990) thinking: licensing, technology integration, technology development, and large-scale basic research into efforts to master technology. IPTN’s success in building aircraft prototypes and ambitions to establish a national auto industry represents the pinnacle of technology transfer initiatives.

This study found that the flaws in Repelita and the policies taken as input on the plan were not viewed from a comprehensive set because the 1998 global economic crisis warped the new Order policy, a huge series. However, this analysis posits that the New Order government has offered sophisticated policy instruments for promoting S&T in various industries but has not achieved the necessary velocity to be globally competitive. Especially following the period of the New Order, additional research is required to determine the effect of measures designed to promote global competitiveness.

## REFERENCES

- Aizawa, I., & Rose, H. (2019). An analysis of Japan’s English as medium of instruction initiatives within higher education: the gap between meso-level policy and micro-level practice. *Higher Education*, 77(6), 1125–1142. <https://doi.org/10.1007/s10734-018-0323-5>
- Akbar, M., & Handayani, T. (2021). Science and technology development in Dutch East Indies. *Indonesian Historical Studies*, 5(2), 115–133. <https://doi.org/10.14710/ihis.v5i2.13475>

- Akrasanee, N. (1981). ASEAN economy 1980: An overview. *Southeast Asian Affairs*, 3–16.
- Birkland, T. A. (2015). *An introduction to the policy process: theories, concepts, and models of public policy making* (4<sup>th</sup> ed.). Routledge. <https://doi.org/10.4324/9781315717371>
- Booth, A. (1995). Southeast Asian economic growth: Can the momentum be maintained? *Southeast Asian Affairs*, 28–47.
- Booth, A. (1999). Education and economic development in Southeast Asia: Myths and realities. *ASEAN Economic Bulletin*, 16(3), 290–306. <https://doi.org/10.4324/9780203060407>
- Central Bureau of Statistics. (1941). *Statistical pocket book of Indonesia*. Departement of Economic Affair.
- Cheok, C. K. (1980). Review of Southeast Asian economies, 1979. *Southeast Asian Affair*, 17–36.
- Cochran, C. L., & Malone, E. F. (2005). *Public policy: Perspectives and choices* (3rd ed.). Lynne Rienner.
- Darusman, D. (1997). Pengaruh perkembangan politik-ekonomi nasional dan internasional terhadap pembangunan kehutanan Repelita VII. In *Pembenahan Kehutanan Indonesia*. Institut Pertanian Bogor.
- Dye, T. R. (2021). *Understanding public policy* (15th ed.). Pearson.
- Gross, A. (2011). *The Floracrats: State-sponsored science and the failure of the enlightenment in Indonesia*. The University of Wisconsin Press. <https://doi.org/10.1353/tech.2012.0003>
- Gross, A., Sedayu, A., & Agrippina, T. (2014). *Belunggu ilmuwan dan pengetahuan: Dari Hindia Belanda sampai Orde Baru*. Komunitas Bambu.
- Habibie, P. B. J. (1990). *Sophisticated technologies : taking root in developing countries Technologies sophistiquees : leur enracinement dans les pays en voie de dhveloppement Hochtechnologie faBt Wurzeln in Entwicklungsländern*. 5(5).
- Hamzah, A. (2019). *Metode penelitian kepustakaan (Library Research)*. Literasi Nusantara Abadi.
- Hill, M., & Hupe, P. (2002). Governance and managing implementation. In *Implementing Public Policy* (pp. 160–195). SAGE Publications Ltd.
- Kintanar Jr, A. (1984). Economic developments in Southeast Asia in 1983: an overview. *Southeast Asian Affairs*, 18–32.
- Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 45(1), 1–28.
- Miller, H. T., & Demir, T. (2007). Policy communities. In *Handbook of public policy analysis: theory, politics, and methods* (pp. 137–148). CRC Press. <https://doi.org/978-1-57444-561-9>
- Nisak, A. K. (2016). Pembangunan bidang pendidikan di Surabaya pada masa Repelita IV tahun 1984–1989. *AVATARA*, 4(3), 1276–1288.
- Nugroho, R. (2014). *Public policy* (5th ed.). Elex Media Komputindo.
- Nurin, H. S., Wiratmoko, D., & Pianto, H. A. (2020). Repelita dalam bidang pertanian di Pacitan tahun 1994–1998. In *STKIP PGRI PACITAN* (Issue Xxiii). STKIP PGRI PACITAN.
- Oktavyanti, D., Kusbiantoro, Sari, K., Arifin, M., Rahayu, S., & Asmara, A. Y. (2013). *Analysis of the development of science and technology policy in Indonesia in the Old Order Era – New Order Era*.
- Simatupang, P., Syafa'at, N., & K. D., S. (1999). Perkiraan kebutuhan investasi sektor pertanian dalam Repelita VII. *Economics and Finance in Indonesia*, 47, 75–102. <https://doi.org/10.7454/efi.v47i1.198>
- Subkhan, I. (2014). GBHN dan perubahan perencanaan pembangunan Indonesia. *Aspirasi*, 5(2), 131–143.
- Tambunan, M. (1998). Economic reforms and agricultural development in Indonesia. *Asean Economic Bulletin*, 15(1), 47–58. <https://doi.org/10.1355/ae15-1d>
- Yue, C. S. (1978). Economic developments in the region. *Southeast Asian Affairs*, 15–34.