

# Evaluation of Space Management During COVID-19 Pandemic Crisis in Indonesia

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**Abstract.** The aim of this research is to measuring performance and identifying problems of space program during pandemic covid 19 in Indonesia. LAPAN (now merger into BRIN) is a space agency in Indonesia, from economic agent (public institution) has a target of contract performance to representatives to achievements in the roadmap document for implementation of space program. The pandemic is a shock that affects changes in the strategic environment and program achievements, including in space program, and global value chain. This study looks at from the point of view of evaluating program during the COVID-19 pandemic. The methods used qualitative analysis use logic model as an evaluation tool. This research uses primary data collect through questionnaire and secondary data. The results are the pandemic had a significant impact on input, activities and output. From input analysis, management must make policy adjustments including budget, human resources, programs, and work mechanisms. From the activity process, indicators such as programs, targets and methods of implementing research and services have changed (example: training and international procurement which cannot be implemented). Research on mastery of technology has the biggest negative impact. The strategy carried out by management is to issue policy changes such as: (i) human resource management policies with flexible working arrangements, (ii) setting program achievement targets and delaying a number of programs, (iii) decrease in service and (iv) cut budget. The implementation of the program has an impact on several targets in the master plan that have not been maximally achieved until 2021.

**Keywords:** Covid-19, Indonesia, Space Program, Impact, Management Strategy

## 1 Introduction

Space is a vital technological infrastructure for development. This is indicated by the role of the technology in various activities and development sectors from upstream and downstream in global value chain. Indonesia is one of the countries that has a program of mastery and utilization of space technology. President Soekarno established LAPAN (2021 now merger into BRIN) in the 1960s as a space agency. The Space Program has a legal umbrella with the Space Act No. 21 of 2013. LAPAN competing with other countries such as NASA (United States), JAXA (Japan), ISRO (India) and KARI (South Korea) doing space activities. It's a special and unique public institution formed in relation to space programs. According of document of Roadmap of Space Activities [1] mention that the space activities consist of space science, remote sensing, space technology, launch, and commercialization. LAPAN (now BRIN) has a mandate to evaluate these achievements. The limited evaluation of the achievements of the current space program in Indonesia in phase 1 of the master plan is

important research to do. Program changes are very possible from the point of view of change theory due to changes in the strategic environment. LAPAN (now BRIN) from economic agent (public institution), has a target of contract performance to representatives to achievements in the master plan document for the implementation of space program. The pandemic is a shock that affects changes in the strategic environment and program achievements, including in the program space, including the global value chain, both globally and domestically

The space activities are programmed through LAPAN's budget (DIPA) in the form of research, innovation and invention, and management until Sept, 2021, and now its manage under BRIN. Space technology can be said as strategic good because it space is dual use technology. It has unique characteristics that are different from other public goods. This technology has high-tech, high-risk and high-cost features and its mastery takes a long time. Space management is necessary to carry out risk management to deal with the risk of failure, as part of high-tech disaster mitigation efforts. The COVID-19 pandemic is one form of disaster that affects the sustainability of the space program in Indonesia. Government policies in handling COVID through activity restrictions have had an impact on program implementation and research performance. Space activities or programs include space science, mastery of technology, remote sensing, launch, and commercialization which have different research environments (technical and non-technical) and long-term programs.

Space research organizations such as LAPAN have employment contracts producing performance-based research products from an institutional economic point of view. From an institutional economic perspective, the management of these research organizations is influenced by managerial transaction costs. Where according to Willioamson [2] the cost of political transactions and economic transactions has a nature of uncertainty. Pandemic covid is a disaster that is an emergency and forces the politics of government budget through several budget saving policies.

The implementation program, LAPAN has a limited budget from the State Revenue and Expenditure Budget (APBN) known as pure rupiah financing. Other sources of space research financing are sourced from pure non-rupiah such as National Sharia Securities (SBSN). Spagnulo et al. [3] mention that program management has to ensure the succes of a project, management is a planning, organization, coordination and control. In international practice, several significant evaluation methods used are logical models [4]. This research method using theory of change approach, referring to the performance measure which covers the measurement of target achievement (output) and outcome or impact. Changes in the dynamic strategic environment originating from the external (international) and internal (national) environment such as the pandemic also affect the achievement of this performance. The changes in the strategic environment and assumptions are necessary to evaluate through this research with logic framework. The logical framework is powerful to monitoring and evaluating program [5].

Since 2020, the COVID-19 pandemic has forced the government to issue a number of policies and focuses on handling covid. In international practice of space program, the pandemic has impacted a number of programs and projects on a minimal, moderate scale and impacted activities remotely, reducing activity levels due to limited access to facilities and delays [6]. In case UK [7], pandemy has had a significant impact to all sector (included space sector). The aim of this research is to measure the performing of space program during covid 19 pandemic in Indonesia.

## **1.1 Theory of Change and Impact of Covid**

Theory of change is describe how to achieved preconditions and long-term outcomes, and represent the project concrete activities [8]. The pandemic is one of the shocking factors that can be seen from the point of view of the theory of change. The following research on the impact of the pandemic provides an overview of the program change process in theory and practice. According to the OECD [9] report, the economic crisis of COVID-19 has either decreased or changed negatively to a positive trend. Also, the report of OECD summarized surveys of the space industry in countries like the United States, Europe, and Korea. The results of studies showed some result. Based on survey in March from Korea Space Technology Promotion Association, about 66% of space companies expect negative effects throughout 2020, 42% percent hoping to recover their business in the first half of 2021, 22% are worried about their future businesses. Space sector firms in the UK reported the survey result, 20% respondents reported structural risks to their businesses, while 63% reported some specific effects, but 18% of respondents reported little impact on their businesses. In the United States, the Department of Commerce, examined the space industrial base, and found that 92% of space companies with R&D as primary business line usually were small business, so that, they provide parts, equipment and other important services. U.S. government agencies have indicated consideration to small businesses and subcontractors regarding the supply chain strategies of small rockets, commercial satellite communications, and microelectronics sectors, were damaged according to survey by the US Space Force Council. There was also survey which was established in German, as a result of the respondents from the space pioneer companies, 40% reported the impact of COVID-19 as "dramatic", threatening the company's existence, and 80% of the new companies that was surveyed found existing government support measures inappropriate.

## **1.2 Impact Covid to Management Program**

Zou et al. [10] studied the Impact of Covid-19 on Firms in Guangdong Province, China. Authors used sample of 524 firms in 15 cities in Guangdong Province that publicly registered by Government and the data was analyzed with quantitative method using SPSS software. The result was, firms in Guangdong faced difficult challenges in pandemic. The percentage shows, 48.7% of firms remained stable, 35.1% experienced closure, 70-90% already move to online commerce and remote office work. 46% believe that they will have losses for 2020, and there were 83.5% who still expect the city's GDP to decrease. This study has limitation since not measure the impact thoroughly, so that, it only can be used as preliminary study for further study regarding impact of COVID-19 on firms on Guangdong Province, China.

World Bank Group (2020) evaluated effect of COVID-19 on Business in firm level with evidence across the world. The paper gives a comprehensive evaluation of the short-term effect of the COVID-19 on businesses around the world which emphasize on developing countries. The dataset collected by the WBG and partner institution coming from 51 countries which includes 100,000 businesses. To begin with, the COVID-19 has affected global firms severely with consistent negative impact on revenue. The other impacts were, the employment adjustment, the smaller companies faced bigger financial constraints, the number of firms that rely on digital solutions increases, and uncertainty about future business.

The other study about firm performance that affected by COVID-19 pandemic, was conducted in China. Utilizing the recorded financial data of Chinese companies. Shen et al. (2020) examined the impact of COVID-19 on business performances. The result appeared if COVID-19 causing a negative effect on firm performance. The negative impact of COVID-19

on firm performance was concluded from result of two parts study, first was the performance forecasting through quantifying the impact of covid-19 by using financial data from 2013 – 2019 which could predict performance in the first quarter of 2020. Then, the forecast result was compared with actual performance during pandemic using 2014 – 2020 data. The paper divided listed-firms into high and low affected groups by region and industry sectors. The paper used Differences-in-Differences model to examine the impact of COVID-19.

In Indonesia, there was study about impact of COVID-19 to the Indonesian companies. Purwanto et al. [11] identified the information by using case study qualitative approach. There were 7 people of top management from some industries who interviewed with semi-structured questions. The result of study was, COVID-19 impact to their business such as, reducing raw materials imports, decreasing sales, declining of demand and sales turnover, difficulty of distribution of goods. The working scheme to the employees were also changed, now, working hours are divided into 2 shifts and the employees only get 70% salary, there are some employees who have received 80% of salary. Haryanto and Mawardi [12] conducted study about how COVID-19 affects performance on Indonesia stock market which yielded negative impact on JCI due to uncertainty which affected investor's behavior.

## **2 Method**

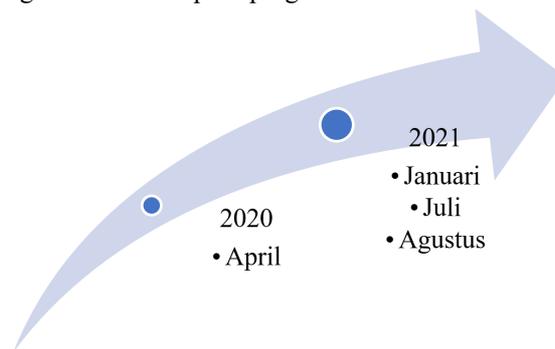
The methods used qualitative analysis with uses logic model as one of evaluation tool. Kellogg Foundation [13] interpret a logic model as a system and a way of visualizing an understanding of the use of operationalized resources for programs, activities at the planning stage and changes or expected results. This research uses primary data and secondary data. Secondary data is data that is compiled through literature in the form of journals, reports, the internet and other sources. The data of this study are limited to the use of LAPAN data as a space agency in Indonesia. The primary data is collect through questionnaires. The sample unit in this research is a technical unit in the environment of research institutions related to space program. Data collection techniques in determining respondents are snow ball and representation representing the population, where respondents represent the work units studied. This distributed to respondents who sit in policy makers, researchers and planners. The collection technique uses open and closed questionnaire filling techniques. In addition to using questionnaires, data is obtained through online and offline from activity reports. Qualitative methods place more emphasis on the observation of phenomena and more research into the subtansi meaning of data-driven phenomena and analysis. Basri [14] mentions qualitative research is on the process and the meaning of the results. Qualitative research focuses on human elements, objects, and institutions, as well as interactions among those elements, in an effort to understand an event, behavior, or phenomenon [15].

## **3 Analysis**

The vision, missions and programs of space in indonesia set forth in the roadmap of space activities [1]. Evaluation of the achievements of space program is by seeing between the ideal conditions and the realization of the implementation of the program from the strategic plan document. The pandemic has had an impact on change on input, output and outcome of space programmes.

### 3.1 Input

The results of the questionnaire and data indicate that the consequences of the pandemic have an impact on the allocation of input use (man, money, method, etc.) to programs in LAPAN. This change in input is caused by a change in policy and regulation. The government issued a number of policies in 2020 and 2021 through the Ministry of Finance related to Refocusing and Reallocation of Ministry/ Institution Spending. Management made adjustments and rearrangements to the space program four times from 2020 to 2021.



**Fig 1.** Stages of Refocusing and Reallocation of DIPA BUDGET LAPAN

LAPAN during the COVID pandemic became an affected agency with budget cuts in the form of budget savings in 2020 and 2021. These savings have an impact on capital expenditure and non-capital expenditure, and go through several stages.

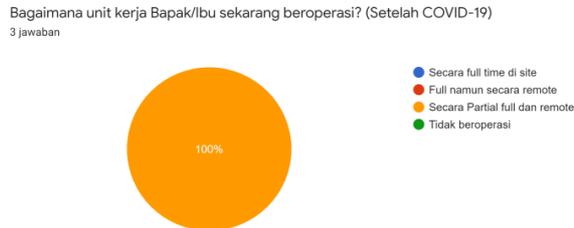
**Table 1.** DIPA LAPAN Budget during Covid Pandemic

	<b>2021</b>
Stage 1 Savings	0
Stage 2 Savings	14.490.103.000
Stage 3 Savings	3.560.011.000
Stage 4 Savings	93.486.738.000
<b>Budget After Refocusing</b>	<b>776.039.418.000</b>

(LAPAN [16] processed)

A number of programs and activities experienced budget cuts and even the elimination of budgets during the covid pandemic. At least 4 times the refocusing stage and in 2021 the budget of LAPAN in stage 4 to Rp 776 billion. Some of the activities affected by the budget reduction are reductions in capital expenditure for the mixing propellant laboratory at the Rocket Technology Center.

According to survey to head of each unit in LAPAN, during pandemic COVID, their operational method is partially full and remote, meaning some of employees attend office, however, some employees work from home. The ratio of WFH: WFO is 75% and 25%. There has been a change in the use of the assumption of human resource allocation.



**Fig 2.** Human Resource Management Policies

### 3.2 Activities

The implementation of activities has changed from the proposed planning. Indicators such as programs, targets and methods of implementing research and services have changed (example training and international procurement which cannot be implemented). Research on mastery of technology has the biggest negative impact. The strategy carried out by management is to issue policy changes such as: (i) human resource management policies with flexible working arrangements, (ii) setting program achievement targets and delaying a number of programs such as delaying the launch of the LAPAN A-4 Satellite, (iii) decrease in service and (iv) cut budget. In terms of outcome achievement, LAPAN was still active in achieving sustainable through remote sensing data bank services, and research.

### 3.3 Output

From several stages of budget refocusing, and reallocation, the impact occurs in almost all programs, both management and research. This impact is experienced by programs financed by the state budget. The impact of pandemics on programs and planning of space research and management activities, grouped into several categories with program setting achievement targets and delaying a number of programs such as delaying the launch of the LAPAN A-4 Satellite. Based on the data obtained, the impact of the pandemic on performance is a decrease in target setting and performance achievements in 2020 and 2021 from the initial proposal and services. This impact occurred in all research units from space science to space technology.

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**Table 2.** Performance Impact 2021

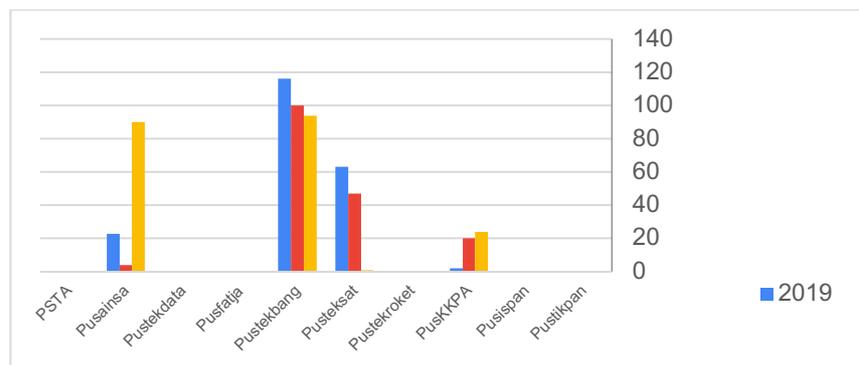
Programme	Output	Decrease Target	Deletion of Activities
Management Support		v	v
Activities of the Deputy of technology activities		v	v
Activities of the Deputy of Remote Sensing			v
Activities of the Deputy for Space Science		v	v

In general, the impact on performance is a decrease in the target of a number of programs / activities and the elimination of activities because they cannot be realized. The impact is experienced in all programs, where performance in the detekno is most widely eliminated. Some of the programs removed in 2021 are the procurement of rocket final assembly and

testing system equipment, completion of fs documents and completion of comparative auto pilot study documents for MALE UAVs.

The decrease in performance targets was carried out from management support programs in 2021 such as the target number of national policy recommendations in the field of aviation and space at international forums from the beginning of 4 to 3, the number of planning and budgeting documents from 7 to 6, internal supervision services from 46 reports to 36 reports, the implementation of internal audits from 21 reports to 14 reports and so on. This decrease in performance is a form of performance adjustment during a pandemic.

The performance output of other research organizations is public service. Some work units have public services in the form of apprenticeship services. During a pandemic, there are some units that actually increase during the pandemic in inthership activities such as the Center for Space Science and the Center for Aerospace Policy. This is due to online-based service innovation. As for work units that experienced a decrease in the number of apprenticeship services such as the Aviation Technology Center and the Satellite Technology Center. This is due to limited access to laboratory facilities and activities require offline activities. Academic Services for Internship trend from 2019 to Quartal 1 2021 shows varied result. Some of divisions service for internship declining but some of them increasing (see Fig. 3)



(Data processed)

**Fig 3.** Academic Services for Internship

LAPAN has a long-term research program in the form of multi year financing and single year. This is related to the nature of technology research that has a stage of mastery of technology from level 1 to level 9 in the level of technological readiness (readiness level). The success of the achievement of the conservation program is influenced by the management of a planned and scheduled conservation program that is influenced by the strategic environment from internal and external. The covid pandemic impacted a number of external policies and conditions that forced lapan research organizations to make adjustments.

The lockdown policy in early 2020 began in Jakarta where, impacting the national lockdown. Government policy through activity restrictions, gave rise to 2 modes of work, namely Working From Home and Working From Office which later became Flexible Working Arrangement. Restrictions on the number of human resources allowed and the sectors allowed to operate. LAPAN management policy and national is also in line with the implementation of policies in a number of countries including in the space research sector. NASA is shifting operations based on Centre fo Disease Control and Prevention guidelines, by closing a number of facilities and mandating telework for a number of non-essential activities [6].

Restrictions on these activities have an impact on the implementation of planning and realization of programs on conservation research. In the sub-cause above, it is explained that covid has impacted several conservation programs. The impact on the program is influenced by limited access to laboratory facilities and human resource restrictions. Program delays are the highest level consequences, followed by reduction of target targets or reduction of programs at the intermediate level, and reduction of activities at the minimum level. This delay is based on delays in some activities such as the launch of the A4 satellite. This delay is influenced by external and internal factors. External is influenced by conditions in India as a satellite launch partner that is also being affected by covid. Internal conditions are the internal policies of the government related to the licensing of the prohibition of visits to several countries. Related to performance achievements, with savings that impact the program, a number of activities are carried out to reduce performance targets. Reduction of performance targets in line with savings in a number of programs and activities

To overcome this, discussions from the aspects of planners, program implementers and leaders and between ministries (trilateral meetings) were conducted and the strategies taken by LAPAN in dealing with this covid pandemic were to re-focus programs and activities, and rearrange strategic programs. One form of proposed research funding strategy is to propose financing planning outside of pure rupiah in a number of high-cost and high-risk programs such as technology-related programs such as MALE UAV, N219 Ampibi Aircraft. For a number of program activities that were removed will be re-submitted in the next year's budget and carry over to 2022.

**Table 3.** Budgeting Programs, Impacts and Solutions

<b>Activities/ Programs</b>	<b>Impact</b>	<b>Solutions</b>
Indonesia's representation in International Fora Activities, Cooperation	Foreign service travel budget not implemented	Reapplying budget in FY 2022
N219 Ampibi Research and Development Program	Procurement package process that is not implemented that hinders the completion of RO	Submission to non-pure financing (LPDP)
Male UAV Research and Development Program	Procurement package process that is not implemented that hinders the completion of RO	
Research and Development Program after the Low Orbit Communication Constellation Satellite Program LAPAN A4	Delayed ground station equipment testing process Delay in completion of AIT and Launch Preparation	Reapplying budget in FY 2022

(LAPAN [16], analysing)

The Bureau of Planning and Finance in LAPAN [16], mentioned at least 9 RO that will carry over to 2022 activities after refocusing and reallocation in 2021 with a total value of Rp. 40,130,591,000,-. This is in showing that budget savings will affect the curve in technology mastery by increasing costs, and time. Where to shift the curve s at the research and development stage to the right. That is, with delays over some activities / programs.

Financing through pure rupiah on several high-cost, high-risk projects had a significant impact during the pandemic. Solutions to non-pure financing become alternatives such as SBSN and other models. Internationally for potentially commercial activities such as commercialization of spaceport in collaboration with private [7] although during the pandemic also affected by program delays. OECD [17] stated that space sector consists of a chain of activities from space manufacturing, rocket launch and satellite operations such as satellite imagery, satellite communication, and broadband. These activities are vulnerable to economic shocks. The impact of COVID-19 on space management in Indonesia causes delayed activities to round off space national programs that fulfill national demand. The impact of the decline in the space economy is illustrated by the economic activities of the research and space industry. One of them can be seen from the decline in the value of imports from procurement or research and industrial activities that are LAPAN partners. Another implication of a number of space program delays is the delay of Cooperation and the delayed benefits of the A.4 satellite function which is expected to support surveillance, mitigation, observation and other activities. The logistics aspect is the main thing that becomes a problem in addition to technological obsolescence which is a threat.

#### **4 Conclusion**

From the above analysis it can be concluded that covid pandemic had a significant impact on the performance and management of space research in Indonesia. From input analysis, management must make policy adjustments including budget, human resources, programs, and work mechanisms. From the activities process, indicators such as programs, targets and methods of implementing research and services have changed (example training and international procurement which cannot be implemented). Research on mastery of technology has the biggest negative impact. Problem of Restriction of activities policy in Indonesia has had an impact on (i) human resource management policies with flexible working arrangements, (ii) setting program achievement targets and delaying a number of programs such as delaying the launch of the LAPAN A-4 Satellite, (iii) lowering numbers of services related to space, and (iv) cutting budget for space R&D and operational. The consequence of this is the negotiation of the targets for planning the road map and the strategic plan of the institution as a form of adjustment to the internal and external strategic environment. In terms of outcome achievement, LAPAN was still active in achieving sustainable through remote sensing data bank services, space education, and research. Limitation of this study is this paper is only expected to be a preliminary study for further research in measuring the outcome or impact of the delayed space activities which could impact the economic activities in Indonesia.

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