

Vulnerability of Spaceport Construction in Biak Island

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Abstract:- The spaceport is an integrated launch area with strict safety and security standards. Indonesia according to the prospective location of spaceport is located on Biak Island. The purpose of this study is to measure the level of vulnerability of Biak Island in spaceport construction. The method used is a survey and focus discussion group with a quantitative and qualitative approach. The results of the study found that the level of vulnerability in the construction of spaceports from the social, economic, infrastructure and ecological aspects that predominantly threatens delays to construction is the challenges for community rejection in terms of land acquisition to meet the range safety radius 2 km. The strategy that must be pursued is the development (include construction and operational) of a spaceport is community empowerment model in an integrated spacecity plan.

Keywords:- Spaceport, Construction, Vulnerability, Strategy.

I. INTRODUCTION

The need for construction of spaceport is contained in the mandate of the Law and Master Plan for the Implementation of Space (LAPAN, 2013; LAPAN, 2017). The short-term and long-term mission in the development is not only for the need for research and development activities, but also commercialization. The potential of the domestic market can be seen from the statistics of commercial launch activities of domestic users from 1976 to the present, where commercial satellite launching activities are still through launch services through other countries. At present Indonesia does not yet have spaceport facilities for missions to LEO or to GSO for commercial use. The limitations of the flight test center facilities currently in Garut, West Java are very vulnerable and limited to one of them close to residential areas. Spaceport is a high-tech national strategic area, where the element of safety and security is one of the things considered. The element of safety is one of the main technical factors in determining the spaceport (Dachyar, M. and Purnomo, Herry, 2018; and Perwitasari, Intan, 2019). The size of the spaceport in different countries, as well as the broad need for the development of aerospace port in Indonesia. The need for safe space for this location depends on the technical criteria that affect launch activities.

One of the negative effects of part of risk management in the stages of spaceport construction is the issue of land acquisition. The same thing also happened in similar infrastructure research in Indonesia, namely airports. Pribadi, B.S., (2015) said that land acquisition is the most serious risk faced is the rejection of citizens who will have an economic impact, so it is necessary to manage social risk. Risk management in aerospace operations consists of at least three indicators: (i) the probability of a dangerous event (such as a rock crash), (ii) the size of danger area, and (iii) the nature of the public exposure (population density) (FAA, 2015).



Fig 1:- Key Risk Indicators
Source: FAA(2015)

Biak Island has become one of the destinations for spaceport, and has become a national program for which LAPAN teams are continuing to feasibility studies. The spaceport construction is like a special airport (Ministry of Transportation, Republic of Indonesia, 2015) which is expected to have an impact on the economy through economic growth (Knippenberger, U., 2010). The economic impact of aerospace development can be in the form of positive and negative impacts. To find out the potential negative impacts caused, the effort to socialize part of disaster mitigation and feasibility is continuously carried out to find out how vulnerable the region and the resources affected are. The stage of socialization continues to be carried out as part of the evaluation in the feasibility of the aerospace development project carried out by LAPAN and related stakeholders such as Wantannas and the Regional Government of Biak Regency in 2018. The importance of the socialization is the presence of vulnerability to the spaceport development that leads to risk can inhibit and disrupt which can affect the success of development. The form of vulnerability can be in the form of shocks, in the form of uncertainty that is disturbing in

the future in the form of human resources, natural resources, financial, social and infrastructure (Kustiningsih, W., 2017). The construction on Biak Island may require the expansion or acquisition of land from LAPAN's current land in Saukoby Village, North Biak District, Biak Numfor District. BNPB (2012) states that the level of vulnerability by high technology is determined by the technology itself, meaning that LAPAN must determine the range safety in the Space Act called zonation. The zonation identify in the spaceport consists of zone 1, zone 2, and zone 3 (LAPAN, 2013) will have an impact on the location needs in spaceport construction and operational on Biak Island.

The importance of vulnerability research in disaster mitigation at the outset is to provide an illustration of how vulnerable people are affected to minimize the risk of disasters due to technology failure. This is in line with the views of Benson and Twigg (2007), where vulnerability is a component of disaster risk analysis, which aims to: (i) identify vulnerable groups in an area, (ii) identify factors that make them classified as vulnerable groups, (iii) assess the group's needs and capacity, and (iv) ensure that development policies, programs and activities aimed at groups, targets or mitigation, and prevent program policies that have potentially adverse impacts. The same type of hazard in the case of non-natural (high-tech) disasters between one location and another, will have different levels of vulnerability, and have different impacts. Therefore, the aim of this research problem is how the level of vulnerability in the North Biak District, Biak Island to spaceport construction.

II. SPACEPORT AND VURNERABILITY

The spaceport (Abdullah, Z., et al., 2008) is defined as an area both on land and in water that is used for launching or returning missions from space vehicles and includes buildings and facilities. National rules in Space Act, article 1, spaceport is an area on land that is used as a basis and / or launch of Space Vehicles equipment with security and safety facilities and other supporting facilities (LAPAN, 2013). Vulnerability of a condition of a community or community that leads to or causes inability to face the threat of disaster (BNPB, 2012). The spaceport can be designated as a special area in accordance with Government Regulation No. 43 of 2010 concerning the Establishment of Special Regions. The complexity of the meaning of disaster vulnerability is defined and elaborated the criteria for disaster vulnerability based on the characteristics of the impact caused on a particular object. Vulnerability, resilience, capacity, and ability to respond in emergency situations, can be implemented both at the level of individuals, families, communities and institutions (Sunarti, Euis, et al, 2009). The vulnerability of an area to disaster is influenced by many factors. Exposure is a major factor that must be taken into account in vulnerability analysis which

can be divided into: (1) physical exposure; (ii) social (population) exposure and (iii) economic exposure. The indicator of physical exposure is the vulnerability of buildings or building infrastructure. The indicator of social exposure is the population, while the indicator of economic exposure can be used for example agricultural production or other production indicators

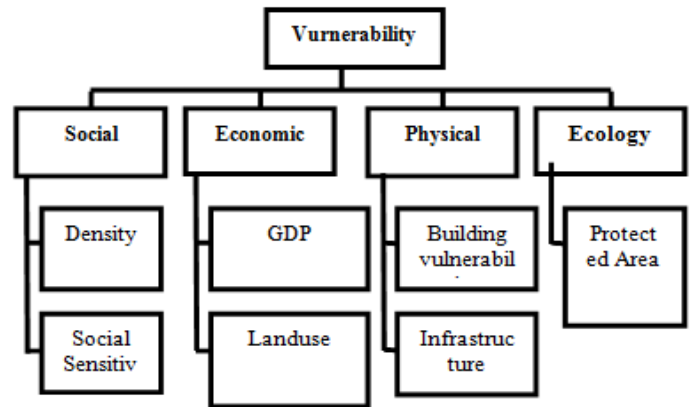


Fig 2:- Composition Vulnerability Indicators
Souce: BNPB (2012)

The element of safety is a major factor in which the construction of spaceports in the regulatory provisions governs the existence of zonation. This zonation if understood in an aerodrome environment (Figure 2) is divided into an area for core facilities and supporting facilities. The core area, known as danger zone 1, is designated as the main activity for spaceport operation. The danger zone 2 and the danger zone 3 will be very dependent on the inter-city spaceport operation mission built on Biak Island.

The framework of thought in this study is

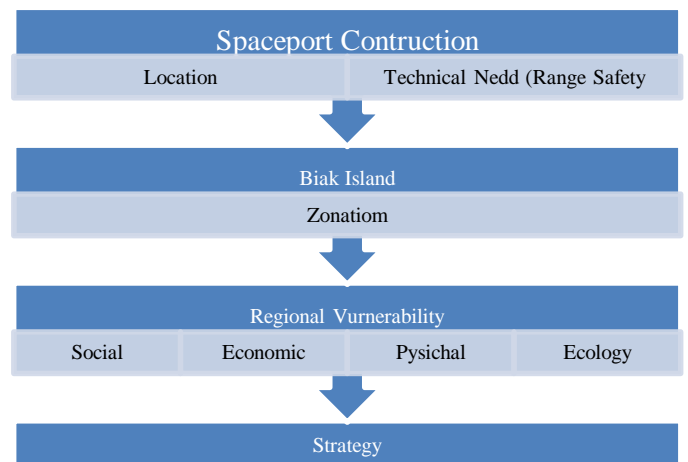


Fig 3:- Framework Analysis
Source: author

III. RESEARCH METHODE

The type of data used in this study are secondary data and primary data. The locus of research was the North Biak District, Biak Numfor District. This research uses descriptive analysis referring to the method used by Kustiningsih, W., (2017) by conducting a qualitative analysis with methods: observation, secondary data collection sourced from BPS, focus group discussions or FGD (Focus Group Discussion) by involving the parties (community, and local government), and in-depth interviews with traditional or community leaders and government officials. The results of data processing analyzed in a tabulated data are quantified to be useful information.

IV. ANALYSIS

❖ *The Dynamics of Spaceport Construction in Biak Island*

The construction of the Spaceport began with a feasibility study (Feasibility study) by LAPAN since 1990 on Biak Island (LAPAN, 1990), taking into account the feasibility of several other locations such as Nias Island, Enggano Island and conical return to Biak Island (LAPAN, 2018). Feasibility study in the construction of spaceports as well as the feasibility of another infrastructure also considers several factors such as: economic viability, social viability (impact of cultural harmony, social environment), technical feasibility (land carrying capacity, distance from city centers, infrastructure), environmental viability (land use, land ownership, relocated population, drainage

system), land availability (land requirements, location availability, etc.) (Kustiningsih, W., 2017). Based on these factors, the North Biak District, in Biak Numfor Regency is best spaceport location in Indonesia (LAPAN, 1990; Dahyar, M and Purnomo, H, 2018; and Perwitasari, Intan, 2019

The target of spaceport construction in accordance with the master plan in the short term up to 2020 is the construction phase which begins with the determination of the location, conducting a feasibility study, master plan, site acquisition, and the development process. The socialization will continue to be carried out from 2018 by involving Wantannas, the Local Government of Biak Numfor and LAPAN to provide information and find out the community's response to the planning of spaceport development. LAPAN has a land area of 100 Ha located in the village of Saubokye, North Biak District. In determining the extent of the impact on the launch pad location planning. The Space Act stipulates the need for zonation arrangements, namely safe zones 1, 2 and 3. Based on the space requirements to meet the safety and security aspects of safety zone 1 (sterile from settlement activities) to support multilevel rocket launch activities with a minimum range of 300 km, then there are 3 ideal scenarios in determining zoning 1 (See Figure 3).

- Scenario 1: 5 km safe radius.
- Scenario 2: 3 km safe radius.
- Scenario 3: 2 km safe radius

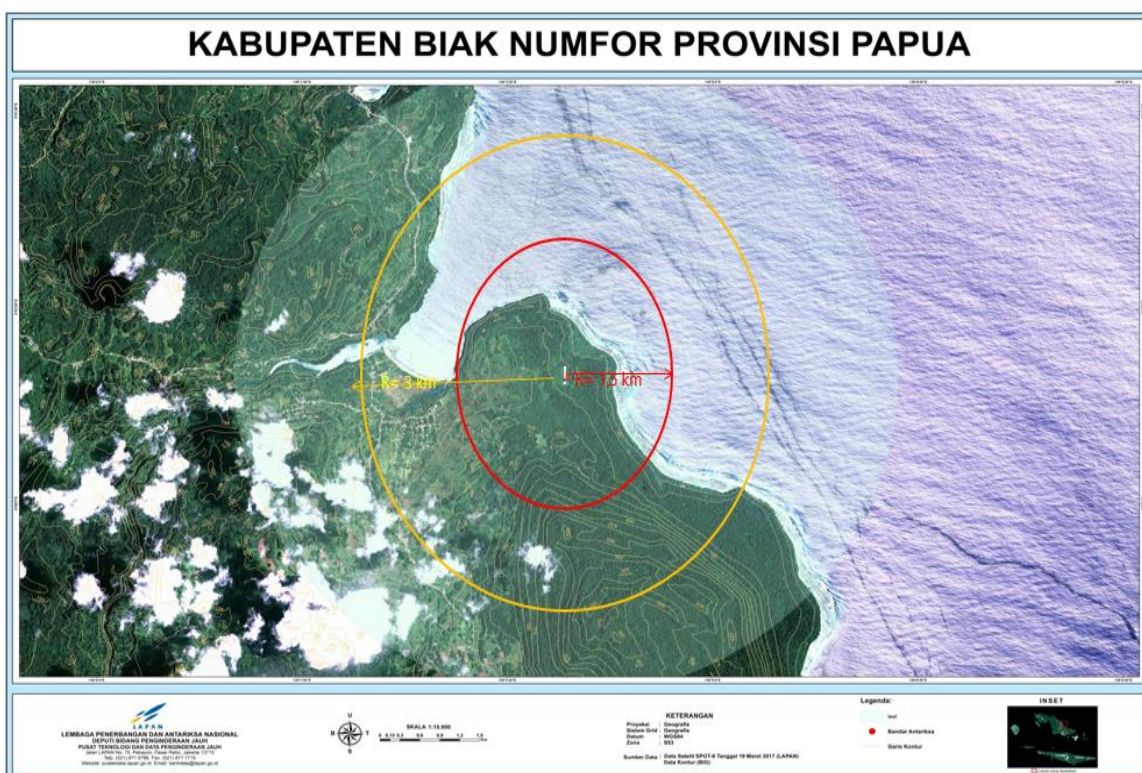


Fig 4:- Range Safety Scenario of Spaceport with Launchpad midpoint at LAPAN land

Source: data processed

Table 1 shows that referring to the practice in the aerospace cities of several countries from the Americas, Europe and Asia, the area and distance to the nearest settlement are not the same. That is because according to Paussin, H (2017) the construction of airports between relies on the design to be developed, namely operational efficiency (including performance, reliability and availability, and effectiveness, that focus on mission launchers. Scenario 3 is range 2 km, is still considered safe

by referring to the existence of Uchinaura Spaceport, Scenario 2, a radius of 3 km by considering the existence of Naro Spaceport and Scenario 1 by considering the existence of Alcantara Space center. Biak spaceport is based on the recommendation of the LAPAN study (1990) which must adopt the concept of growth or phasing, which is to meet the needs of national independence on a temporary basis and to consider international technology and markets.

Spaceport Indicator	Naro Space Center (Republic of Korea)	Uchinoura (Japan)	Tanegashima (Japan)	Guyana Space Center (French)	Alcantara Space Center (Brazil)
Geography	34° 25' 54.72"N 127° 32' 6.25"E	31° 15' 3.6"N, 131° 4' 55.2" E	30° 24' 0" N, 130° 58' 12" E	5° 14' 14" N 52° 45' 38" W	2° 22' 23" S 44° 23' 47" W
Comparison of rotational speed with equator	82,5 %	85,5 %	86,3 %	99,6 %	99,9 %
Land Area	5.494.719 m ²	704.345 m ²	8,64 km ²	21 km ² (ELA 3 for ariane 5)	620 km ²
Range to Resident (closed)	4 km	1,5 km	n.a	12 km	7 km

Table 1:- Global Spaceport Location
Source: data processed

Referring to international practice, benchmarking in the Guyana (France) spaceport, mentioned that a range launch is a launch site for rocket launches which includes facilities for detecting stages of rocket launch, receiving signals (telemetry) and sending communication commands (telecommand), that are included on board segment and a ground segment (H. Poussin, L. Rochas, T. Vallee, R. Bertrand, J. Haber, 2017). While the distance between the launchpad and these settlements each spaceport is different. Seen in Table 1, which refers to the practice of several countries by looking at the rocket technology that was launched, the shortest is Uchinaura Spaceport which is only 1.5 km safe radius of the closest settlement to the launchpad point. Adopting the practice from the largest to the smallest then, scenario 3 was determined, the range safety for the spaceport of the LAPAN land location is 2 km. From Guyana best practise, French Space Agency (CNES) operated the launch range facilities, and on-behalf of the French government ensures flight safety for all launches, in compliance with the regulation mandated by the French Space operation Act (H. Poussin, L. Rochas, T. Vallee, R. Bertrand, J. Haber, 2017), so LAPAN has same position likes CNES in Biak Spaceport. LAPAN also has same function likes CNES, that CNES provides all needed range support, and managed day by day life Guyana Spaceport/ Space Centre (Arianespace, 2016).

❖ *Vulnerable Group Identification*

The location of the LAPAN land is located in Saubokye Village covering an area of 100 hectares, and for the needs of the spaceport to meet the needs of a range of 2 km, it has an impact on the need for expansion around the current LAPAN land. Administratively, the spaceport construction is located in the North Biak District. Safety zone needs by considering hazard zone 1, which is assuming a range of 2 km, it will have an impact on the community in the North Biak District.

Indicators	Amount
Population (people)	KK:117/ 527
Density (jiwa/km)	62
Land Area(km ²)	8,5
Dray Land (ha)	850
Village/RT	(2)/(0)
Bamuskam/ Ormas	(1)/(2)

Table 2:- Demographics of Prospective BA Locations in Saubokye Village in 2016
Source: BPS Kab Biak Numfor (2017)

Table 2. shows that in Saubokye Village, there were 117 families with a population of 527 people in 2016. A total of 9 village representatives out of 12 village representatives (or 75 percent) in the North Biak District were sampled from the distribution of respondents

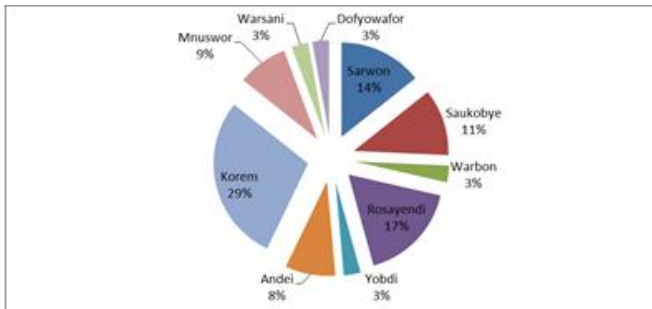


Fig 5:- Origin Identity of Respondent Participant Villages in the Northern District
Source: Data Processed

❖ *Determinants of Vulnerability*

A. *Components of Economic Vulnerability*

The level of economic vulnerability by BNPB (2012) is influenced by GRDP factors per sector and land use. The spaceport construction in the North Biak District, threatens the livelihood of the community as farmers. The reason for those who disagreed was their hope that LAPAN would only use the 100 ha of land, and they could not farm anymore, or catch fish again (Survey, 2019). According to the Assistant Regent I of Biak Numfor Regency (2019), the village community itself has not maximally utilized the existing village funds. This causes the economy to not develop. Bappeda (2019) said that the current structure of regional revenue itself is very minimal, even minus to finance routine costs, so it still depends on funds from the center.

B. *Components of Social Vulnerability*

The level of social vulnerability is influenced by the culture and social environment of indigenous peoples. The land acquisition is related to community ownership of land rights and the possibility of land ownership rights or government infrastructure.

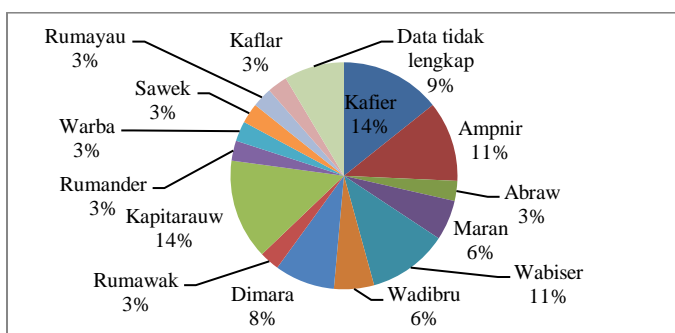


Fig 6:- Identity of the Origin of Respondent Participants in the North Biak District
Source: data processed

From the distribution of questionnaires, 35 sampling data were received, of which 100 percent were male, and domiciled as the head of the family. Based on the origin of the clan, as many as 15 of the clan group representatives participated in filling out this questionnaire. Tanah LAPAN itself is located in Saukoby Village, where the division was made, namely Warbon Village and Saukoby Village.

If you look at Figure 5, 2 representatives from the village coconuts who are in the LAPAN land location also attended the socialization and filled out this questionnaire.

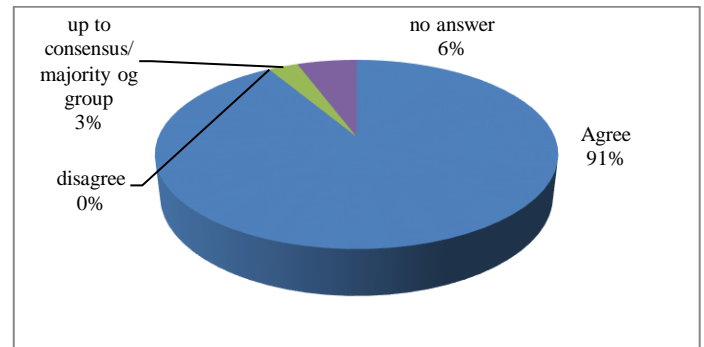


Fig 7:- Community Response to the Spaceport Development Plan on Biak Island
Source: Data Processed

When asked about community responses to the BA development plan on Biak Island, 91 percent of 35 respondents agreed and 3 percent said it was up to the community and 6 percent (or 3 people) did not answer, and 3 percent (1 person) stated that it was up to the community. To those who did not answer and submit to the community, from the discussion process during the socialization they stated that they actually refused, but knew their position was weak due to the voice of their minority. And the form of their disagreement among them is one of the clans namely Abraw proposed this as a violation of human rights to the Papua period. The results of the survey (2019) they cannot move for fear of the curse of their ancestors if they leave the inherited land

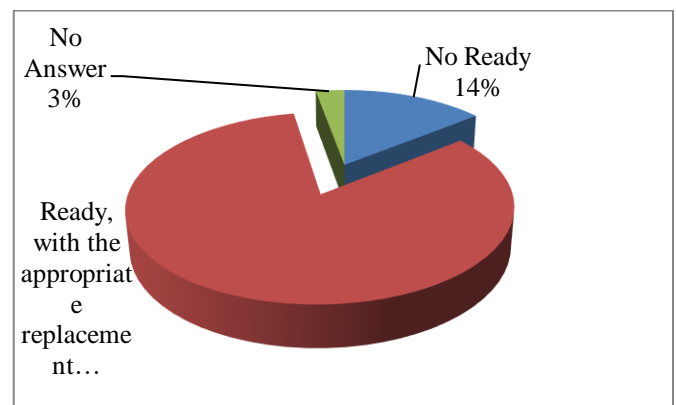


Fig 8:- Community Response to Willingness to be Relocated for Spaceport Development on Biak Island
Source: Data Processed

The results in Figure 5, are strengthened by the results in Figure 6, where 83 percent (out of 35 respondents) answered that they were willing to relocate or sell their land with the appropriate compensation, 14 percent said they were not willing and 3 percent did not answer.

C. Physical Vulnerability Components

Indicators of physical vulnerability include the existence of buildings and infrastructures. In terms of spatial planning, space port has been accommodated in the regional government layout. This is in line with the national spatial plan where space port is designated as a national strategic area. Spaceport is an area in a transportation intermodal determined as a high-tech National Strategic Area (KSN) which has been determined in the spatial plan of Biak Numfor Regency but needs to be revised in relation to the location of North Biak. Allotment of KSN Area of Earth Station Satellite Weather and Environment and TT&C Launching Vehicle is intended to develop support activities from the utilization of resources and / or high technology, including preventing negative impacts from the use of natural resources and / or high technology on environmental functions and public safety. Thus, the determination of the location of the aerospace port needs to be obtained based on the needs of the LAPAN, it is necessary to obtain regional approval related to the positive impacts that will be obtained and the estimated negative impacts that must be anticipated and minimized.

The carrying capacity of the infrastructure available to support logistics transportation to the North Biak District are:

- Educational facilities at the tertiary level in Biak City:
- Health facilities: 3 hospitals (1 RUSD, and 2 TNI hospitals), 18 health centers (2015 data)
- Security / Military Facilities: Indonesian Air Force / Navy / Navy, Polri
- Hotel Facilities

Survey results (2019) for modern market facilities on Biak Island currently there is only 1 supermarket level. so for food supply there is a need for investors to enter. In addition, the KSN KAPEK Biak did not work because community opposition was a challenge in spaceport construction. Middle industry for construction and others currently in Biak is not available. For the construction industry sector will come from outside the Biak Island.

D. Ecological Vulnerability Components

The location of the LAPAN land area of 100 hectares and an expansion of 6.5 km², is a location in the protected forest area. For utilization, LAPAN already has the use rights certification for 100 hectares, but due to the wide assumption requires an additional area of 6.5 km, it is necessary to socialize with the community for the purpose of land acquisition and need to apply for a permit to use the Ministry of Environment and Forestry. Customary rights over land ownership have been accommodated in government administration and this is in line with research from Enembe, Luke (2016), Papuans always take customary law over problems that occur specifically land affairs. The results of discussions with Bappeda (2019) convey that relocation of villages is very difficult.

❖ Strategy

Problems from potential land conflicts according to Sandyavetri (2015) will cause obstacles in achieving development goals. The form of a solution or strategy to minimize this vulnerability is to pay attention to the expectations of the community towards the construction of the space shuttle. The results of the survey (2019), the community expressed the following expectations:

- the son of the land owner gets a job
- children get educational facilities
- contributes income to breeders
- prosperous and cultured society
- rights, indigenous peoples to be considered
- the construction of the BA can start immediately

The positive impact that is expected to be achieved by the construction of this spaceport is that in general the group can provide a stimulus to economic growth through increasing regional income and improving the quality of human resources, especially for those who enter vulnerable groups. The results of the research related to the strategy of handling the possibility of changes in land functions that cause the change of professional functions and the risk of resettlement of residents can be overcome by providing compensation for money, land, shares, employment opportunities, replacement of land rights, compensation for waiting periods, housing procurement and CSR / training for professional change (Personal, BS, 2015)

Based on Presidential Regulation Number 80 Year 2018 Regarding Space Master Plan, the strategies to be carried out in supporting the implementation of the Spaceport are as follows:

- improve the quality and quantity of human resources through higher education and research development;
- developing launch facilities and infrastructure; and
- enhance cooperation in the construction, operation and development of spaceports, both domestically and abroad.

To address this vulnerability, the strategy is related to increasing cooperation, based on discussions with the Bappeda and LAPAN (2019) teams, proposing cooperation in the form of legal norms. These results are supported by Kustiningsih (2017) research in which the government's response to vulnerable groups must be facilitated in legal policies.

V. CONCLUSION

Vulnerable groups in the construction of spaceports are those who live in Saukoby and Korem villages. Economic development through infrastructure development should consider the quality of its human resources, in this case the impact of social and cultural changes from the people affected by the construction of the aerospace and consider their livelihoods in part as farmers. Grand design space city (space city) in a spatial concept such as a space city is expected to accommodate vulnerable groups in the

North Biak District. The need for synergy in spatial planning by the Local Government of Biak and LAPAN for the concept of space city in Biak with the community development model. Kustiningsih (2017) states that this community empowerment model used in the airport city concept is based on community and stakeholder participation. This comdev model needs to be synergized with the Village Fund program known as the Village-Owned Enterprises (BuKam) in North Biak, as part of empowerment and reducing the level of vulnerability that will minimize the risk of development and operation of the spaceport.

ACKNOWLEDGEMENT

Thank you to the Head of the Aerospace Policy Studie Centre, Dr. Robertus Heru Triharjanto, M, Sc for quidance, and permission to conduct data collection in the field and also to researchers Dr. Arif Nur Hakim (for advise and quidance) and Herry Purnomo, ST, MT from the Rocket Technology Center for their support, and discussions conducted to enrich this research.

FUNDING

This research (survey) was sponsoring with DIPA Aerospace Policy Studies Centre, LAPAN Years 2019.

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