CHAPTER I

THE PROBLEM

1.1 Rationale

Indonesia is country archipelago the biggest in world Which consists of of 17,001 islands with the 4th largest population in the world that is as much as 281,603,800 soul [11] With amount island And With such a large population, there is a big problem in Indonesia, namely problem telecommunications .

The main problem in the telecommunications sector in Indonesia is the difficulty development of wireless and cable network infrastructure so that it cannot reach all areas. This is evident in the Palapa Ring optical network

which have not been able to reach the island regions spread across Indonesia, especially including areas that are not covered by signals (*Blank Spots*), even though several islands have the potential for developing telecommunications businesses. According to Albandjar and Rasyid (2005) which makes it difficult to build *wireless network infrastructure.* and also cable the is :

1. The very large number of Indonesian islands requires costs. investment that big for build a network that connect the islands the.
2. Uneven distribution of population. There are very significant differences. striking difference between population density in cities and villages, Java Island and the islands other, as well as region Indonesia part west And part east.

There is a solution for Indonesia to be able to connect to the telecommunications network, namely by using GEO satellites. GEO satellites are satellites that are in the GSO orbit located in the equatorial orbit or equator which is 36,000 km above the earth's surface.

And the one most often used to receive signals from GEO satellites is VSAT or also known as a micro earth station [13]. The main function of VSAT is for receiving and sending data to satellites. Satellites functioning as an access network to be sent to other points on earth. Dish VSAT the facing to a satellite *geostationary* [12], *Geostationary* satellites are satellites that are always in the same place. in line with the rotation of the earth on the axis Which it is possible Because orbiting at the same point above the earth's surface, and following the rotation Earth. A *geostationary satellite* can cover an area of 40% the earth's surface, 2 integrated satellites can reach more from half the surface of the earth and 3 satellites are able to reach the entire surface earth [12]

It is expected that VSAT can be a cheap and efficient telecommunications connector compared to having to build terrestrial infrastructure such as fiber optic and submarine cables, the cost of which can be said to be not a little. However, an analysis is needed to minimize the design and implementation costs. Technical Economic Analysis itself is a method of theoretical analysis to combine the analysis of the implementation aspects of a technology with its economic value so that it becomes more efficient. In this case, Technical Economic Analysis can be used as a reference for selecting the right technology in terms of technology and economics in building a VSAT satellite network design .

1.2 Theoretical Framework

Based on the explanation of the description above, it can be formulated that the problem to be answered in this study is how to analyze technically, economically and regulatoryly connection technology using GEO satellites to reach blank spot areas as a substitute for terrestrial transmission networks, both Microwave and Fiber optics, where there are still shortcomings in terms of coverage and costs that are quite large. The problem that arises when using microwaves is when they collide with obstacles such as mountains that reduce signal coverage, or with fiber optics that are limited to terrestrial areas and the absence of Palapa Ring infrastructure that reaches the eastern islands of East Java. Where there are 34,784 people (Bappeda Kab. Sumenep, 2003) who need telecommunications access to interact to explore natural resources or tourist attractions.

1.3 Conceptual Framework/Paradigm

The purpose of this study is to determine the efficiency of capex and opex related to the use of GEO satellites to integrate between BTS HUBs on Sapudi Island through analysis. *budget link* , *techno economic* and regulation . With the massive development of blank spot areas. By taking into account the rental price that will be offered to cellular operators with the condition of the Indonesian archipelago consisting of more than 17,000 1 islands where it is not possible or very difficult to build terrestrial transmission. With the selection of the right satellite and calculations from the Subscriber side to find the required band width capacity will get revenue and target data prices that will be given to cellular phone users.

1.4 Statement of the Problem

a) Network Limitations: Many areas, especially on small islands and remote areas, still do not have adequate access to telecommunications networks, be it cellular networks or the internet.

b) High Development Costs: Building telecommunications infrastructure in remote areas is very costly, given the difficult geographical conditions and limited accessibility.

c) Care and Maintenance: Maintaining existing infrastructure in remote areas is also a challenge, as it requires high operational costs and limited skilled manpower.

d) For this case, the author will analyze the techno-economic area of East Java by considering the regional income from both livestock and tourism on Giligenting Island, Sapudi Island and Raas Island.

1.5. Hypothesis

a) The implementation of a satellite network integrated with geo-infrastructure will significantly increase the coverage of telecommunications services in remote areas and blank spots, especially in geographical areas that are difficult to reach by conventional terrestrial infrastructure.

b) The use of satellite technology to overcome telecommunications blank spots will have a positive impact on regional economic growth, especially in sectors that depend on connectivity, such as tourism, agriculture and trade.

c) The high initial investment costs of building satellite infrastructure will be offset by long-term operational efficiency gains and the potential for new revenues from telecommunications services in previously unserved areas.

d) Variables in Analysis: Satellite Technology: Type of satellite, capacity, and orbit used. Geo Infrastructure: Type and location of earth stations, and integration with terrestrial networks. Cost: Initial investment costs, operating costs, and comparison with terrestrial infrastructure. Quality of Service: Latency, throughput, and other service qualities. Economic Impact: Regional economic growth, increased income, and job creation. Social Impact: Increased access to information, education, and health services. Government Policy: Regulation, incentives, and government support

1.6. Assumption

a) Satellite: Satellite capacity is sufficient to serve the target number of users, especially for services with tolerable latency. Satellite launch and operational costs can be reduced along with technological developments, such as the use of small satellite constellations and new satellite technologies. Dependence on weather is minimal, so service quality is not affected by extreme weather conditions.

b) Geo Infrastructure: Earth stations can be built in strategic locations and connected to terrestrial networks, especially in areas with high potential demand for services. The cost of building and maintaining an earth station is relatively affordable, especially for earth stations with smaller capacities. Availability of stable electrical power at the earth station location, or the existence of a solution alternatives such as solar power generation.

c) Integration with Mobile Networks: Integration between satellite networks and cellular networks can be done seamlessly and efficiently, so that users can switch between the two networks without interruption. The communication protocols used are compatible between the two networks, such as 5G non-terrestrial network (NTN) technology.

d) Economy: The development of satellite infrastructure will have a positive impact on regional economic growth, especially in sectors that depend on connectivity, such as tourism, agriculture and logistics. Initial investment costs can be recovered within a certain period of time through revenue from telecommunications services, especially from corporate and government customers. There is a multiplier effect from this investment on other sectors, such as tourism and education.

1.7. Scope and Delimitation

a) Literature Study Approach Used

Research on the potential use of GEO satellites for 3T areas was conducted using the *Link Budget* and techno-economic approaches. Where techno-

economics is a paradigm/approach used to assess a particular project, product, or service using technical and economic perspectives[2]. While *Link Budget* is a calculation of gain and loss between sender and receiver which aims to predict the performance of a communication network.

b) *Interconnectivity* Technology Aspects between *Satellite* and RAN

This research focuses on VSAT technology that can be used to connect between BTS. VSAT networks are used for connecting between BTS and BSC using an SCPC modem which has G703 (T1/E1) interface. VSAT technology for cellular communication between BTS and BSC is used in areas that cannot use technology microwave or Line of Sight (LOS), such as in mountainous areas or islands - remote island. [3]

c) Research Area Limitation

For this research, the research location is focused on the East Java archipelago area, where Sapudi Island & Raas Island have the potential for expanding telecommunications networks . Apart from that, the reason for choosing this location is because there are several commodities in the area and a large number of residents who are subscribers to cellular operators.

1.8. Importance of the Study

Techno-economic analysis research that focuses on the use of satellites and geo-infrastructure to reach cellular telecommunications blank spot areas

has a very crucial role in the development of telecommunications infrastructure in Indonesia, especially in remote areas. Here are some reasons why this research is very important:

a) Thorough Planning: This study provides a solid foundation for thorough planning in building satellite infrastructure. By conducting a comprehensive analysis, we can determine the most appropriate technology, optimal ground station locations, and accurate cost estimates.

b) Effective Decision Making: The results of this study can be used as a basis for decision making related to investment in satellite infrastructure. Governments, telecommunications operators, and investors can assess the economic feasibility of the project and determine whether the investment provides sufficient returns.

c) Resource Optimization: Through this research, we can identify ways to optimize the use of existing resources, be it financial resources, human resources, or technological resources.

d) Risk Mitigation: This research helps to identify the risks that may arise in this project, such as technical risks, financial risks, and political risks. Thus, we can develop effective risk mitigation strategies.

e) Performance Evaluation: The results of this study can be used as a benchmark to evaluate the performance of the project after

implementation. Thus, we can identify areas that need improvement and make necessary adjustments.

f) Policy Development: This research provides valuable input for the government in formulating policies that support the development of satellite infrastructure. The right policies will create a conducive investment climate and encourage the growth of the telecommunications sector.

g) Contribution to Sustainable Development: By expanding access to telecommunications services, we can contribute to the achievement of sustainable development goals (SDGs), such as reducing the digital divide, improving the quality of education, and developing the economy in remote areas.