CHAPTER I
INTRODUCTION

1.1 Background

Broadband is an enabler of economic change, where Broadband has an essential role in creating conditions for sustainable economic growth and improving people's welfare. Broadband will influence economic dynamics and social welfare since the number of sectors and economic activities are increasing. Drivers of growth factors include innovation, the emergence of new services, new processes, new business models, and increased competitiveness and flexibility in the economy. World Bank study concludes that 1% fixed broadband penetration is expected to reduce the unemployment rate by 8.6%. Through the use of 10% broadband penetration would encourage economic growth by 1.21% in developed economies and 1.38% in developing ones [1]

In broadband technology currently use two types of technology, known as fixed Broadband and Wireless Broadband. Fixed Broadband is one of the broadband services that uses cable as a transmission medium (wireline), which provides communication and information channels from the central to the service users (users). While wireless Broadband does not require cable in providing communication and information channels as a transmission medium, it is usually passed by other transmission media such as air and microwaves. With line as a transmission medium from the central to the end-user, the infrastructure investment needed to construct fixed Broadband is higher than wireless Broadband.

	CAPEX				OPEX		
	Backbone	Backhaul	Last mile	Equipment	GTM	Maintain	Run
FTTx	+	++	+++	+	+	+	
FWA	+	++		+			+

Figure 1.1 Cost comparison Fixed and Wireless Broadband [2]

The high investment costs required and demands of Fixed Broadband Operators provide better services and increase the number of customers, traffic and data speeds. But on the other hand, the continued decline in cost per GB prices and increased Operational Cost Expenditure (OPEX) make it difficult for operators to deploy the capacity and coverage of fiber optic networks, especially to areas where traffic potential is not high, resulting in "Scissor Effect" arising from not the balance between income and operational costs which increasing every year [3].

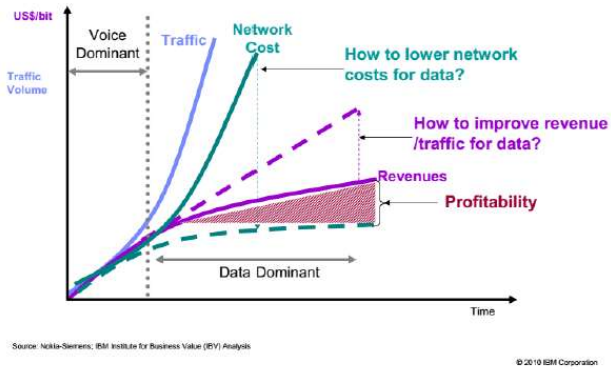

Figure 1.2 Scissor Effect [3]

The implication of the "Scissor Effect" resulted in the number of households connected to the fixed broadband access network in Indonesia in Q3 2019, according to data from the Ministry of Communication and Information, only reaching 14.5% of households and 3.7% population [4]. This penetration rate is far from the national target set in the 2014-2019 Indonesia Broadband Plan. The 2019 national broadband development plan can provide fixed access broadband in urban areas to 71% of households (20 Mbps) and 30% of the population. In rural areas, fixed access broadband infrastructure is expected to reach 49% of households (10 Mbps) and 6% of the population [5].

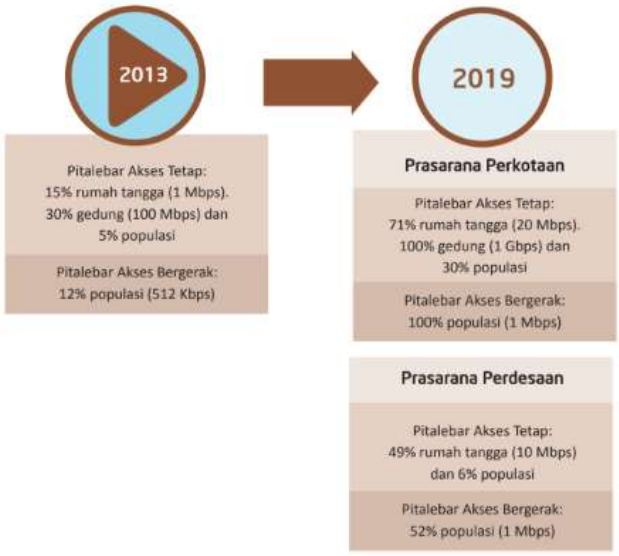

Figure 1.3 Indonesia Broadband Plan Objectives 2014 - 2019 [5]

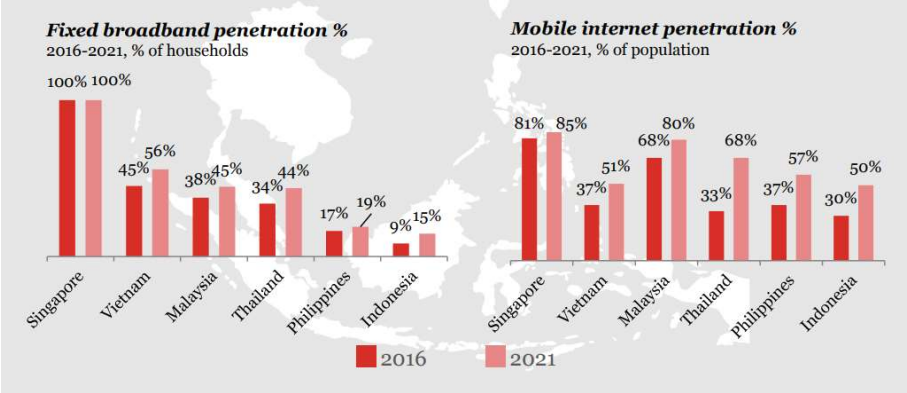

Figure 1.4 Broadband Penetration Outlook [6]

A study developed by PWC shows that fixed Broadband in Indonesia still has a very high chance of growth, wherein 2016 broadband penetration was around 9% and it is predicted to increase to 15% in 2021 [6]. The emergence of 5G is expected to overcome the gap of the last mile (endpoint) access network connections requiring high costs. One use case that emerged in the 5G era was Fixed Wireless Access (FWA). FWA is allowing mobile technology to intersect with the demands of fixed-line services and price points. FWA enables network operators to deliver ultra-high-speed Broadband to supporting home and business applications where fiber is prohibitively

expensive to lay and maintain. 5G FWA can provide a competitive alternative to cable and fiber across all markets.

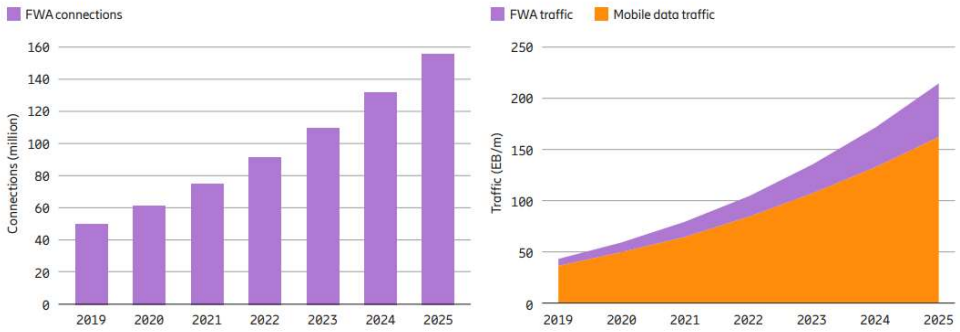

Figure 1.5 5G FWA Subscriptions Outlook [7]

Ericsson estimate there were almost 160 million FWA connections by the end of 2025, with data traffic projected to grow reach 53 EB in 2025 [7]. So it is necessary to do a study to show FWA is feasible for solved the "scissor effect" problem based on techno-economic research and input for the government and Operators to consider implementing Fixed Wireless Access in Indonesia.

1.2 Problem Identification

The need to accelerate the telecommunications' growth has implications for Indonesia, requiring a higher broadband penetration. This thesis focuses on analyzing cost investment needed to overcome the scissor effect by implementing Fixed Wireless Access using two selected frequencies in Mid – band and High – band.

Based on the background, problems discussed in this research are the needs of telecommunications network infrastructure, the economic aspect of broadband deployment and regulation related to 5G FWA deployment in Indonesia.

1.3 Objectives

This research will focus on techno-economic analysis on 5G Fixed Wireless Access implementation for Fixed Broadband operators in Indonesia. The final result of this research is to provide recommendations for its implementation in Indonesia.

1.4 Problem Limitation

Some assumptions and limitations of the problem used in this thesis research are as follow:

1. The frequency used is 3.5 and 28 GHz, Comparison the 3.5 GHz allocation is the mid-band and 28 GHz in the high-band allocation used in the 5G network
2. The object of research on this Thesis used data from one of fixed broadband operator in Indonesia
3. The area used as a reference for research is Citra Raya Cikupa residential area
4. The calculation of cost deployment focus on the access network element
5. Techno-economic calculation is done the feasibility of NPV and IRR
6. Regulatory review based on existing regulations issued by the Ministry of Communication and Information and other regulation related to telecommunications in Indonesia

1.5 Research Methodology

The research methodology used in this Thesis is as follow:

1. **Literature Study**

   A literature study is done by searching data in papers, journals, textbooks and various other studies that support this research.

2. **Collecting Data**

   Data collection includes existing telecommunication infrastructure, market share and number of LIS (Line in Services). Also, other data regarding current applicable regulation and revision plan related to this research.

3. **Analysis of Techno-Economic**

   Conducting calculations and techno-economic study by looking at the market, asset and matters relating to the FWA Implementation from the operator side.

4. **Conclusion**

   The conclusions contain the results of the analysis that have been summarized from this research that will be conducted along with the suggestions for the operators that are expected to be useful**.**

1.5 Hypothesis

Implementation of Fixed Wireless Access will accelerate broadband deployment and depress operators' expense in terms of network investment as a competitive alternative to cable and fiber. FWA will significantly reduce deployment time because FWA didn't require cable installation and easier to gain a deployment permit than fiber optic. The use of 5G FWA in the Mid-band was considered the most suitable solution because it costs less to build and maintain the network.