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**Analysis of the Needs of ICT Ecosystems to Support the Acceleration
of Internet Fixed Broadband Penetration
(case: Bogor, Sumedang, Bangli, and Karangasem)**

***Analisis Potensi Demand Penggunaan Internet Fixed Broadband
(studi kasus: Bogor, Sumedang, Bangli, dan Karangasem)***

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Abstract

This study is conducted to see the potential demand with the characteristics of the campus environment, industrial environment, and tourism environment on internet fixed broadband use, where the objective of this survey is limited to households, individuals and businesses. Analysis is carried out in a descriptive manner based on the results of qualitative discussions by experts which is reinforced by the findings of the survey results. The survey results show that the internet utilization by the public (households, businesses) is mostly for communication and entertainment, so that the cellular internet is considered adequate for public's internet need. This is relevant to the public's opinion that 87.9% of the internet needs are met when using cellular phone. There are 3 (three) perceptible reasons of why respondents choose not to subscribe to Fixed broadband internet, namely: 1) There is no necessity for subscription, 2) Lack of Knowledge/Information related to Broadband Fixed internet, and 3) Expensive Prices. The potential demand for each characteristic is always there, however, the most dominant one comes from the businesses, such as cafes/eateries, food stores, gift shops, photocopying businesses, vehicle rental services, travel businesses, etc.

Keywords: Internet, Fixed broadband, Width

INTRODUCTION

In supporting the growth of national development and Indonesia's competitiveness by improving the quality of life of the people, the government issued Presidential Regulation No. 96 of 2014 on Indonesia Broadband Plan 2014-2019. Based on the 2016 Networked Readiness Index (NRI), Indonesia is ranked 73 out of 139 countries, with the lowest index on the use of international bandwidth capacity (Infrastructure and Digital Content pillar), the number of internet users, and the number of fixed broadband internet subscribers (Individual Usage pillar). Based on the 2017 ICT Usage Survey data, Indonesia's internet usage activities is dominated by communication activities (chatting, sending e-mails, etc.). Meanwhile, the average amount of credit spending per month is in the range of Rp50,000–100,000, according to data from the 2016 DNA Ecosystem Survey. Some of these findings indicate that there is no considerable demand for internet utilization in Indonesia. Dwivedi, Lal, & Williams (2009) conducted a study that provided an overview of broadband adoption behavior in the UK and the results showed that a number of constructs of attitude (utilitarian, hedonism), normative (social influence), control (self-efficacy and facilitation of resource conditions) and consumer demographics (age) significantly influence consumer adoption behavior. In addition, C. Srinuan & Bohlin (2013) explained that the variables of fixed infrastructure, income, gender, age of consumers, and residential areas have various impacts on services so that they can encourage competition and stimulate the growth of access and use of fixed broadband.

A research (Riva Atul Wahab, 2016) shows that the reason why people do not have internet access is because of the high service costs. Rendon

Schneir & Xiong (2016) found that network deployment costs in European sub-cities or rural areas are on average 80% higher than deployment costs in urban or rural network, leading to a digital divide within the same rural areas. Infrastructure development to provide these services requires large investment costs, where the largest cost (70--80%) incurred in public works (for example: excavation, pole installation). Different policies/regulations are adopted in different regions, making it difficult for the Right of Way and Open Access provisions to be implemented. In addition, illegal levy practices are still found, which increase the operational costs of operators when building infrastructure. This leads to the expensive cost of fixed broadband internet in Indonesia, as stated in the Measuring the Information Society Report 2016 which stated that the cost for fixed broadband internet subscription in Indonesia and several other Asian countries is considerably higher than the maximum cost set by the broadband Commission, which is 5% of the GDP. This is in contrast to several European countries, which have been deploying their broadband networks earlier, thus making the ICT ecosystem better prepared to support the need for fixed broadband internet access at a lower cost.

The WorldBank report written by Minges (2016) stated that an increase of 10% penetration of fixed broadband access will increase GDP growth by 1.21% in developed countries and 1.38% in developing countries. While GDP growth will experience a higher increase when adding 10 cellular subscribers per capita than adding 10 fixed broadband subscribers, broadband has the highest GDP growth increase compared to other technologies. Using the same model, calculations are made using the latest data of 86 countries (Scott,

2012). The study stated that a 10% increase in fixed broadband access penetration will increase 1.35% GDP for developing countries and 1.21% increase in GDP for developed countries. Dkhil (2014) stated that in developed countries, less stringent regulatory policies encourage broadband deployment, while tighter policies inhibit innovation in the telecommunications industry. However, in developing countries, these regulations have a strict negative impact on broadband deployments. Therefore, based on the illustration, the problem formulation is as follows: "What is the potential demand for the use of fixed broadband internet in some areas (Bogor, Sumedang, Bangli and Karangasem)?"

METHODOLOGY

This study employs a mixed methods by collecting qualitative and quantitative data, integrating two forms of qualitative and quantitative data to gain an in-depth understanding of the phenomenon under study (Creswell, 2014). The mixed methods research used is the convergent parallel mixed methods where research is carried out through qualitative and quantitative research simultaneously to obtain a comprehensive analysis (Creswell, 2014: 15).

The sampling method used in this research is purposive sampling method on the grounds that there is a need to determine sample areas that have certain characteristics. Purposive sampling is one of the non-probability sampling techniques where the researcher determines sampling by determining special characteristics, where in this study are the unique characteristics of an area, and dominant occupation or characteristics of individuals, which are in accordance with the research objectives so that it is expected to be able to answer research problems.

Primary data in the quantitative research is obtained through survey research methods by paying attention to several aspects, namely affordability (affordability, price rationality, and needs), desire (problem recognition, information search, and alternative evaluation), and purchase interest (interest, positive belief/perception, and decisions). The survey is conducted on 300 respondents in 4 regions with attention to the characteristics of the area; tourism environment, education (campus), and industry.

ANALYSIS AND DISCUSSION

Existing Regulations on the Provision of Fixed Broadband Service Access

The current legal basis for the development of fixed broadband at this time is Regulation of the President of the Republic of Indonesia Number 96 of 2014 on Indonesia Broadband Plan 2014-2019. The development of fixed network infrastructure, especially fiber optic (FO) networks in Indonesia is still lagging behind the deployment of mobile broadband infrastructure, so the targets set in the Presidential Regulation are difficult to meet.

The government, through the Ministry of Communication and Informatics, is preparing for the acceleration of the development of fixed broadband through government intervention and regulations. Government policies related to the acceleration of broadband development through fixed networks with the drafting of the "Joint Circular of the Minister of Home Affairs and the Minister of Communication and Informatics on Guidelines for Development and Sharing of Passive Telecommunications Infrastructure". In the circular, the scope of passive infrastructure includes ducting, telecommunication pole infrastructure, microcell pole infrastructure,

telecommunication tower infrastructure and tunnel infrastructure.

This circular provides guidelines for local governments and business actors in the development and sharing of passive telecommunications infrastructure in order to achieve effectiveness in developing telecommunications services, cost efficiency and accelerate the development of telecommunications service provision with the principle of open access. This circular letter is expected to support the acceleration of broadband infrastructure development, particularly fixed broadband.

In practice, there are many regional regulations that are not in line with the central government's policies in the acceleration of the development of fixed broadband networks. Industries have complained about such regulations when applying for licenses for network deployment in certain areas. One of them is the Badung Regency Regional Regulation Number 6 of 2008 on the arrangement, construction and operation of integrated telecommunications towers in Badung Regency, Bali. The regional regulation had caused a polemic because it only allows one tower provider to operate in the area, indicating monopolistic practices are occurring.

The Broadband Commission stipulates that all countries must have a National Broadband Plan by 2015. It is expected that in 2015, broadband services can reach 40% of the world's households with a maximum service price of 5% of monthly income. Therefore, Indonesia has formulated a broadband development policy in the Indonesia Broadband Plan document 2014 – 2015, where the targets for internet penetration in Indonesia until 2019 were set up.

Indonesia Broadband Development 2014-2019 Concept

To accelerate broadband access in Indonesia, the government has established Presidential Regulation No. 96 of 2014 on the Indonesia Broadband Plan (RPI). RPI provides strategic direction and guidance in accelerating and expanding Broadband development that is comprehensive and integrated within the territory of Indonesia for the period of 2014-2019. Indonesia's Broadband is built to achieve 3 (three) development goals, namely:

1. Promoting economic growth and increasing national competitiveness;
2. Supporting the improvement of the quality of Indonesia's human resources; and
3. Maintaining national sovereignty.

Meanwhile, targets of the development of Indonesia Broadband by the end of 2019 as stated in the RPI Presidential Regulation are:

1. Increasing access range and speed to infrastructure.
 - Urban: Broadband fixed access infrastructure reaches a penetration rate of 30% (thirty percent) of the total population, 71% (seventy one percent) of total households with a speed of 20 Mbps (Mega bits per second), 100% (one hundred percent) of total buildings with a speed of 1 Gbps (Giga bits per second). In addition, the target mobile broadband access with a speed of 1 Mbps, reaches the entire urban population.
 - Rural: Broadband fixed access infrastructure reaches a penetration rate of 6% (six percent) of the total population and 49% (forty nine percent) of total households with a speed of 10 Mbps. The target of broadband mobile access

with a speed of 1 Mbps, reaches 52% (fifty two percent) of the rural population.

2. The price of services becomes a maximum of 5% (five percent) of the average income per capita per month.
3. The implementation of the development of 5 (five) priority sectors consisting of e-Government, e-Education, e-Health, e-Logistics, and e-Procurement.

In achieving the target of Indonesia's broadband development, 11 comprehensive and integrated policies and strategies for accelerating and expanding broadband development within the territory of Indonesia have been formulated. One of the policies to achieve the target of accelerating rural and urban broadband access is the acceleration of the development of fixed broadband access according to the development targets in rural and urban areas that have been set.

Campus Area

Survey location for areas with campus characteristics is Jatinangor subdistrict, Sumedang Regency. In this subdistrict, the Faculty of Agriculture and Animal Husbandry of Padjajaran University was built in 1988.

Table 1. Profile of Jatinangor Subdistrict Demographic

Area (Km ²)	26.2
Number of Family	25349
Population Density/ Km ²	867

Source: Jatinangor Family Planning Field Officers (PLKB) 2016

In Jatinangor subdistrict, 50% of its villages has urban status which belong to the development group of self-employment and self-sufficiency. Therefore, population of the villages have advanced living conditions who can fulfill all their needs and received

a sufficient level of education. The residents have already starting to adapt to sophisticated technology and equipment, their livelihoods are no longer dependent on the agricultural sector.

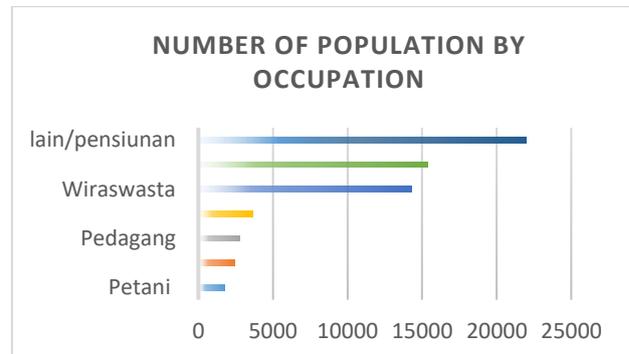


Figure 1. Number of Population by Occupations

Source: Jatinangor Subdistrict Potential 2016, processed (Jatinangor Subdistrict in Numbers 2017, 2017)

Data from Statistics Indonesia (BPS) stated that the majority Jatinangor population are pensioners, laborers and entrepreneurs. Meanwhile, the total number of Jatinangor residents with the professions of civil servant, members of the National Army (TNI) and Police (POLRI), and traders combined is only 8.28% of the population.

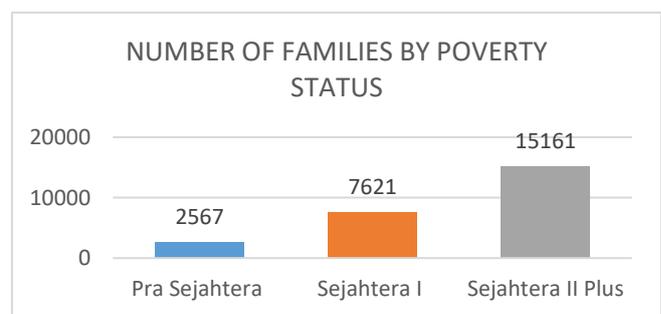


Figure 2. Number of Families by Poverty Status

Source: PLKB Regional Technical Implementation Unit 2016, processed

Lee, Marcu, & Lee (2011) found the factors that influence diffusion of fixed broadband are Local Loop Unbundling (LLU), income, population density, education, and service prices. Data on number of families in Jatinangor subdistrict shows that 60% Jatinangor families are classified as prosperous plus, that is, families with a higher social

level where the family regularly volunteers to provide assistance in the form of material contributions for social activities encouraged by philanthropy. Families in this category are also actively involved as members of the management of social organizations.

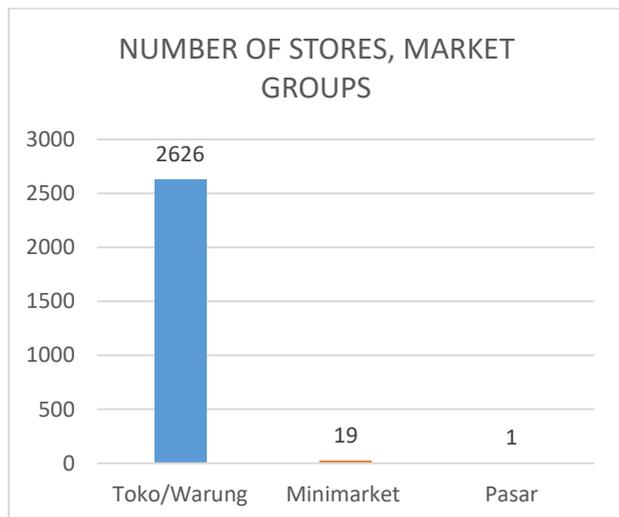


Figure 3. Number of Stores/narket Groups

Source: Jatinangor Subdistrict Potential 2016, processed

Based on occupations, most Jatinangor residents are pensioners/others, laborers/employees and self-employed. Thus, Jatinangor lands are mostly used for business activities. This is also encouraged by the large market potential for its strategic locations surrounding the campus, driving the growth of business in the surrounding area.

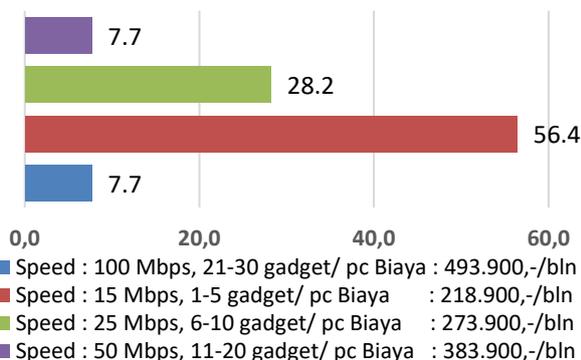


Figure 4. Commitment to Subscription Fees

P. Srinuan, Srinuan, & Bohlin (2012) found that changes in price, housing type and age were the main

determinants of broadband connection. The area of residence and service provider influence the likelihood of using broadband. Based on the results of the survey conducted, the most chosen indicator of commitment to subscription fees is 15Mbps internet with a subscription fee of Rp218,900 per month. Therefore, the most preferred package is the 25Mbps speed package with a subscription fee of Rp273,900 per month. It is so assumed because the average income of Jatinangor residents is only Rp2,500,000. Only a small proportion of the population who are committed to the other two more expensive packages.

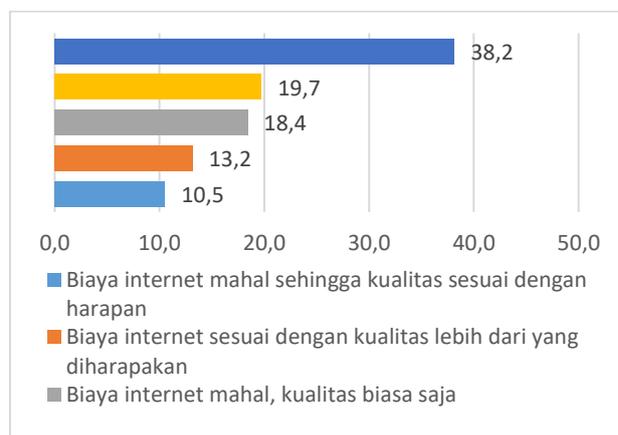


Figure 5. Cellular Cost and Quality Perception

Based on the survey result-based graph above, it can be seen that 38.2% of Jatinangor respondents perceived the internet cost they currently spend as expensive yet not as expected quality. While 19.7% perceived the cost of internet was inexpensive but the quality is not as expected. 18.4% perceived internet cost as expensive with mediocre quality, 13.2% perceived the internet cost is in accordance with the more than expected quality, and 10, 5% perceived internet costs as expensive but with quality as expected.

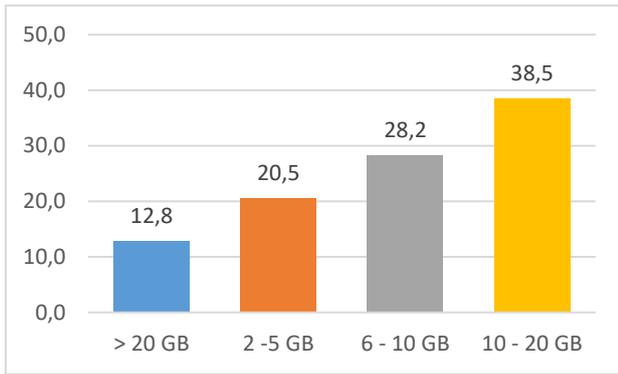


Figure 6. Data Service Needs

Jatinangor’s data service demand is enormous, where 38.5% respondents claimed their monthly need of 10 to 20 GB of data service. In fact, 12.8% respondents claimed that they need more than 20GB per month.

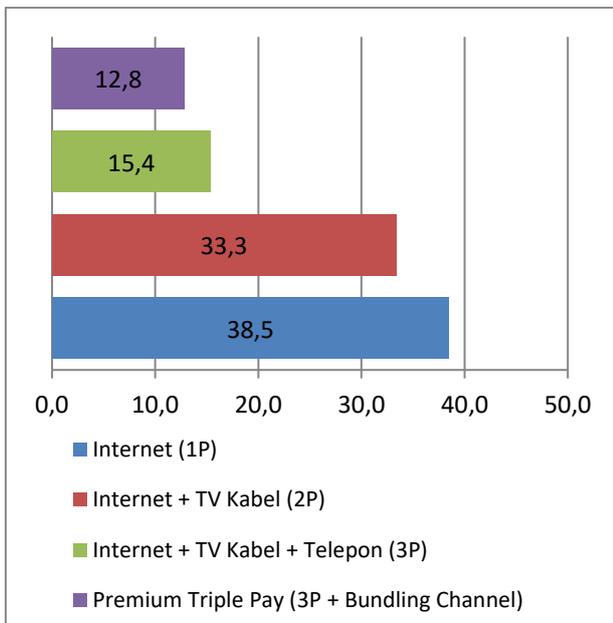


Figure 7. Highest Demand Package

The highest demanded package by Jatinangor respondents is the internet only package. This is implied from the percentage of 38.5% respondents who claimed to only need an internet package if subscribing to a fixed broadband internet. This may also be one of the reasons for low number of fixed broadband internet subscription in the area, because so far operators offer bundle packages where people have to pay more for services they do not really need.

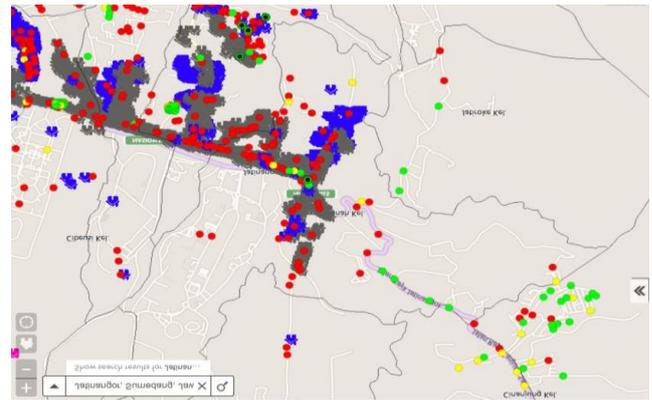


Figure 8. Jatinangor Network Mapping

Source: PT. Telkom Indonesia’s Sales Indihome Information System (SIIS), 2018

From the mapping made by Telkom’s Sales Indihome Information System (SIIS), it can be seen that Jatinangor has a potential demand which is marked in blue, which represents residential areas. The red color represents Optical Distribution Point (ODP). The ODPs cross areas with considerable density of residents. This condition explains that many settlements around the Jatinangor UNPAD campus area have subscribed to optical cable internet. Most of these settlements are boarding houses, which are mostly occupied by students.

Industrial Area

Survey locations for areas with industrial characteristics are Cileungsi subdistrict, Bogor Regency. The industrial sector is growing quite rapidly in this area. The development of industrial estates in the Cileungsi area will be projected as a support between industrial areas such as Cipeucang-Cileungsi, Weninggalih-Jonggol, the Kirana Utama industrial area, and the Cariu Industrial areas.

Table 2. Cileungsi Subdistrict Demographic Profile

Area (Km ²)	73.79
Population (people)	325.769
Population Density/Km ²	4708

Source: (Cileungsi Subdistrict in Numbers 2018, 2018)

Based on BPS data which is mentioned in Cileungsi Subdistrict Report in Numbers 2018, it was stated that the majority of the Cileungsi population only graduated from elementary school, and as many as 10.33% of the population did not complete elementary school.

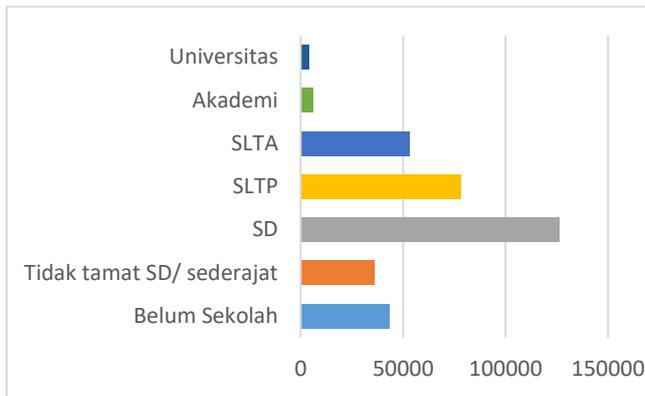


Figure 9. population by education

Source: BPS Projection on the Population of Bogor Regency

Meanwhile, the number of people who attended high school education is only around 15.38%. This shows that in average, the level of education in the region is low.

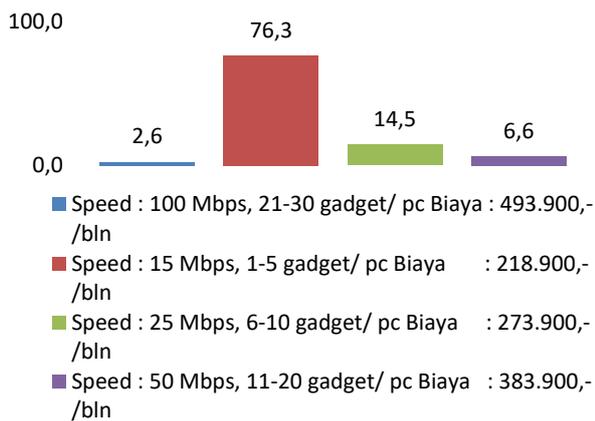


Figure 10. Commitment to Subscription Cost

Based on the survey on the commitment to subscription fee, 76.3% respondents chose a subscription package with a speed of 15Mbps with a subscription fee of Rp218,900 per month and 14.5% respondents chose a package with a speed of 25Mbps

with a subscription fee of Rp273,900 per month. Only 9.2% of the remaining respondents stated that they were able to subscribe to the other two more expensive package options.

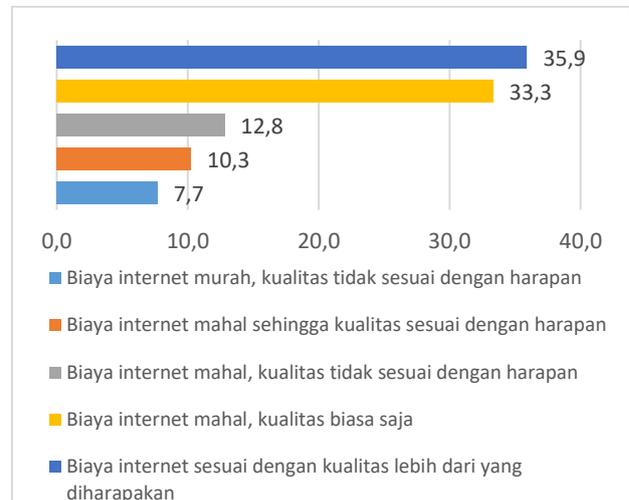


Figure 11. Perception on Cellular Cost and Quality

Based on the survey result-based graph above, it can be seen that 35.9% Cileungsi respondents perceived the internet cost they spend is suitable with the quality which is more than expected. Whereas 33.3% perceived the internet cost as expensive with mediocre quality, 12.8% perceived the internet cost as expensive with quality that was not as expected, 10.3% perceived the internet costs as expensive but nevertheless the quality was as expected and 7.7% perceived the internet cost as inexpensive but the quality was not as expected.

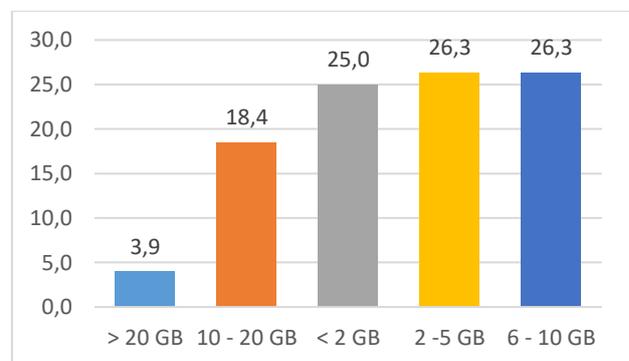


Figure 12. Data service need

Cileungsi's data service demand is considerably

large, where 18.4% respondents claimed their monthly need of 10 to 20 GB of data service. 26.3% respondents claimed their monthly data service need between 2GB to 5 GB, and only 3.9% claimed they need more than 20GB per month.

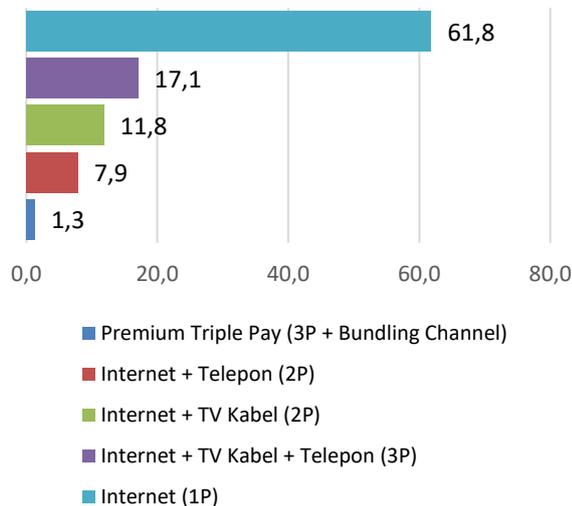


Figure 13. Highest demanded package, on subscription

The highest demanded package by Cileungsi respondents is the internet only package. This is implied from the percentage of 61.8% respondents who claimed to only need an internet package if subscribing to a fixed broadband internet. This may also be one of the reasons for low number of fixed broadband internet subscription in the area, because so far operators offer bundle packages where people have to pay more for services they do not really need.

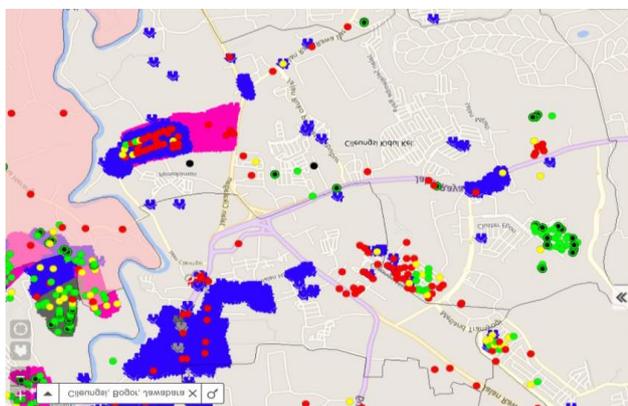


Figure 14. Pemetaan Network Cileungsi

Source: PT. Telkom Indonesia SIIS, 2018

From the mapping made by Telkom’s Sales Indihome Information System (SIIS), it can be seen that Cileungsi has a potential demand which is marked in blue, which represents residential areas. The map shows that Optical Distribution Point (ODP) have not cover residents’ houses. It can also be seen that several ODPs have not been optimally utilized, marked with the green, yellow, and pink points. The settlements in Cileungsi tend to be concentrated at certain points, outside of which many business places are built.

Tourism Areas

Survey locations for areas with tourism characteristics are in Panglipuran village, Bangli Regency. Penglipuran Village was designated as a tourist village by the Bangli Regency government in 1995. Since then many tourists have come to tour the village. In this study, the survey was continued to other locations because of the insignificant potential demand of fixed broadband internet. Survey was expanded to Karangasem which is located about 60 km from Bangli Regency.

Table 3. Karangasem Regency Demographic Profile

AREA (KM ²)	839.54
PROJECTED POPULATION (POPLE)	410.8
POPULATION DENSITY /KM ²	490

Source: Karangasem Regency in Numbers 2018, 2018)

Karangasem Regency offers many tourism sites to explore. Therefore, majority of local residents built their businesses in the forms of souvenir shops, vehicle rental services, travel services, lodging, and the likes.

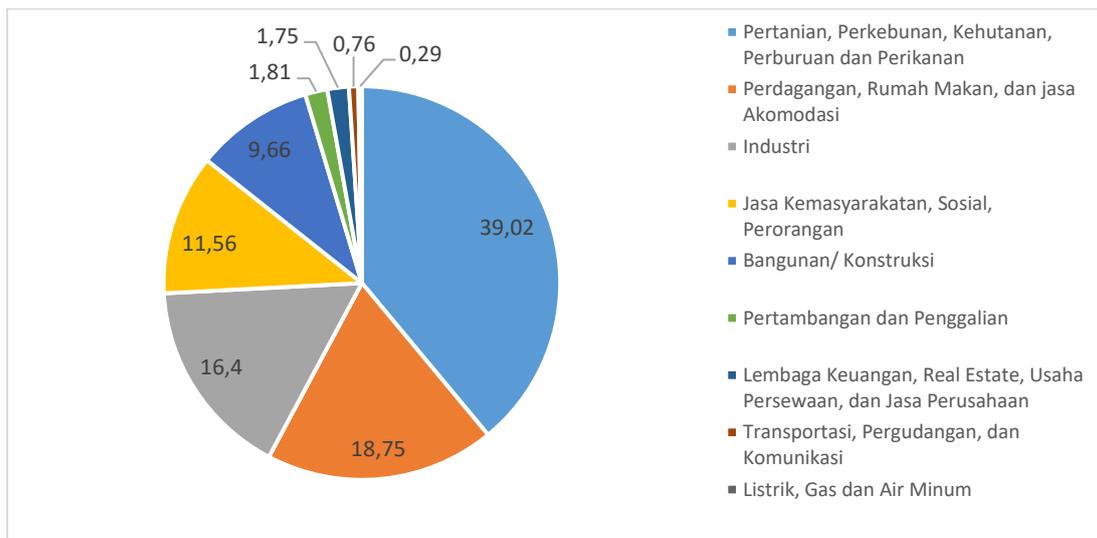


Figure 15. Percentage of Labor Force by Employment

Source: Karangasem Regency Statistics Agency (Based on National Labor Force Survey 2015)

In the report Karangasem Regency in Numbers 2018, it is found out that more than 40% of Karangasem labor force have occupations in the business sector such as trade, restaurants, accommodation services, industry, community services, social services, and the likes.

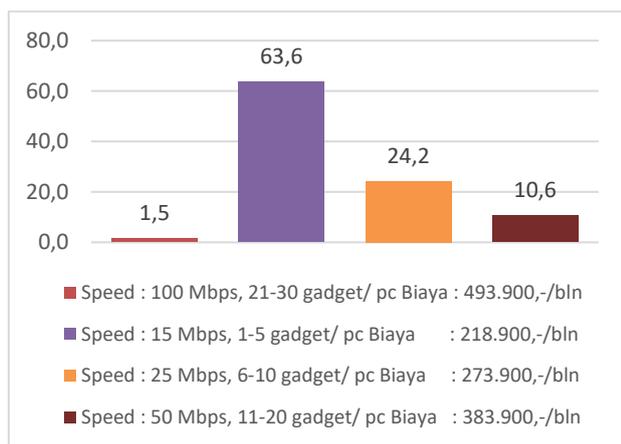


Figure 16. Commitment to Subscription Fee

Survey on the commitment to subscription fee on Bangli and Karangasem respondents revealed that 63.6% respondents chose a subscription package with a speed of 15Mbps with a subscription fee of Rp218,900 per month, 24.2% respondents chose a

package with a speed of 25Mbps with a subscription fee of Rp273,900 per month. Only 11.1% of the remaining respondents chose to subscribe to the other two more expensive package options.

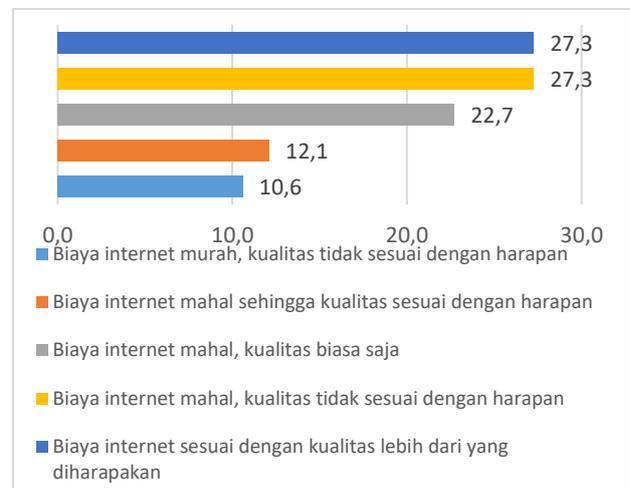


Figure 17. Cellular Quality Perception and Cost

Based on the survey result-based graph above, it can be seen that 27.3% Bangli and Karangasem respondents perceived the internet cost they spend is expensive but the quality is not as expected. Another 27.3% respondents also perceived the internet cost is suitable with the quality of service which is more than they expect. Whereas only 10.6% perceived

internet cost as inexpensive, but the quality was not as expected. 22.7% perceived internet cost as expensive with mediocre quality, and 12.1% perceived the internet cost as expensive but nevertheless the quality was as expected.



Figure 18. Data Service Demand

Bangli and Karangasem areas do not exhibit large demand of data services. 40.9% respondents answered that they only need 2 to 2.5GB of data service every month. It is predicted that the condition is resulted from the locations which are relatively remote from big cities so that the people's lifestyle does not require internet access too much. However, there are quite a number of respondents who answered the size of their data service needs. 15.2% answered that they needed 10 to 20 GB data services per month and 12.1% respondents answered they need more than 20GB per month. This demand is mainly caused by the need to provide internet access for tourists visiting the sites.

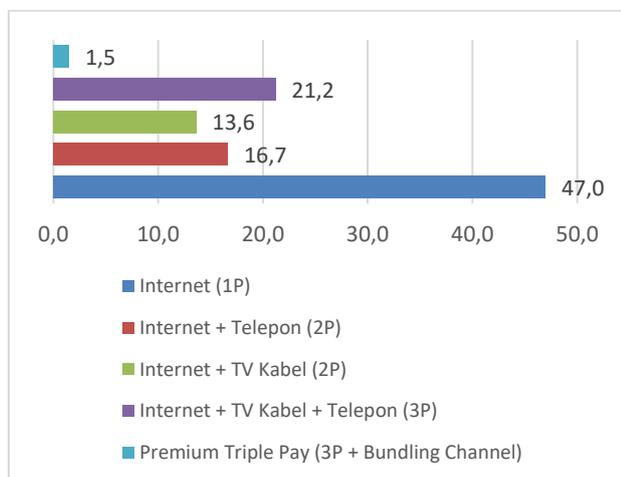


Figure 19. Highest demanded package, on subscription

The highest demanded package by Bangli and Karangasem respondents is the internet only package. This is implied from the percentage of 47% respondents who claimed to only need an internet package if subscribing to a fixed broadband internet. This may also be one of the reasons for low number of fixed broadband internet subscription in the area, because so far operators offer bundle packages where people have to pay more for services they do not really need.

SSIS mapping shows the lack of infrastructure network availability in Bangli regency.

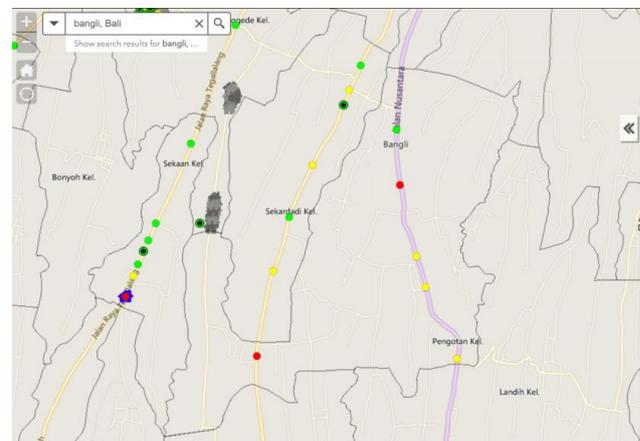


Figure 20. Bangli Network Mapping

Source: PT. Telkom Indonesia's SIIS, 2018

Many of the developed infrastructure networks have not been utilized. This is possible considering lack of public demand for fixed broadband internet.

In contrast to Bangli Regency, the SIIS mapping illustrates potential for community demand in the Karangasem area. There are infrastructure networks that cross residential area, however, it appears that many of them have not penetrated residents' houses.

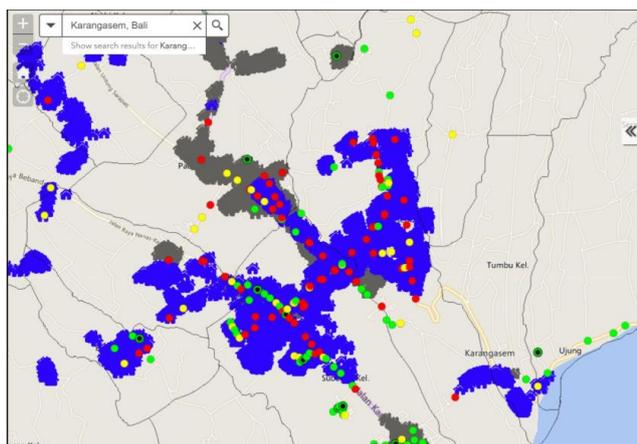


Figure 21. Karangasem Network Mapping

Source: PT. Telkom Indonesia’s SIIS, 2018

Is indicated from the not-optimally utilized existing ODP. Karangasem district has many business places that provide products or services, especially along the coastal tourism sites. In this area, many local and foreign tourists visit to buy handicrafts or other

products.

Challenges to Fixed Broadband Internet Penetration

Based on ITU’s "Measuring the Information Society Report" in 2017, fixed broadband subscribers in Indonesia are the lowest compared to neighboring countries such as Vietnam, Thailand, Singapore, and Malaysia. The number of fixed broadband subscribers is only 2% per 100 population, far below the average for Asian and Pacific countries. In general, broadband users in Indonesia are still lagging behind the selected neighboring countries, but the comparison of the percentage of fixed and mobile broadband subscribers in Indonesia has the biggest gap.

Table 4. Comparison of Fixed Indicators between Indonesia and neighboring countries

Indicators 2016	Indonesia	Vietnam	Malaysia	Thailand	Singapura	Asia&Pasifik
<i>Fixed broadband</i>						
<i>fixed broadband subscribers per 100 population</i>	2.0	9.6	8.7	10.7	25.6	11.3
<i>fixed broadband prices (% GNI pc)</i>	10.6	1.7	1.1	3.8	0.5	14.5

Source: *Measuring the Information Society Report 2017 Volume 2*

If you look at the comparison of the price of fixed broadband services to the percentage of GNI (gross national income) per capita (pc), Indonesia has the highest service price compared to the selected countries (10.6% GNI pc). Although this percentage is smaller than the average price of Asia Pacific (14.5% of GNI pc), it is still much higher than Thailand (3.8% of GNI pc), Vietnam (1.7% of GNI pc), Malaysia (1.1% of GNI pc) and Singapore (0.5% of GNI pc).

The price of fixed broadband services in Indonesia is much higher than the price of mobile broadband services. The price of mobile broadband services in Indonesia is around 2% GNI pc for 1GB mobile broadband services. Meanwhile, the price of fixed

broadband services in neighboring countries such as Thailand, Malaysia and Singapore is less than 4% of the GNI pc. Vietnam is a country with a policy that fixed broadband service prices are cheaper than mobile broadband, thus encouraging fixed broadband service penetration to reach 9.6% of the 100 population.

Based on the data above, the most important challenge to penetration of fixed broadband access in Indonesia is the high service price, so that people prefer to use mobile broadband even though it has limitations compared to broadband services through FO.

Table 5. Indonesia's ICT Development Index 2015 - 2017

Subindeks	IP-TIK 2015	IP-TIK 2016	IP-TIK 2017
Akses & Infrastruktur	4,81	4,88	5,16
Penggunaan	2,21	3,19	4,44
Keahlian	5,38	5,54	5,75
IP-TIK	3,88	4,34	4,99
IP-TIK (versi ITU)	3,85 ^{*)}	4,33 ^{*)}	- ^{*)}

Source: Statistics Indonesia, 2018

Therefore, Indonesia's adoption and utilization of broadband services is still low, as in the ICT Development Index (IP-TIK) report, it is said that Indonesia's IP-TIK in 2017 increased from the previous year, but the index is still low. Therefore, to accelerate the penetration of fixed broadband, especially FTTH access, it is necessary to have a policy in place to drive affordable service prices. A research (Santoso, 2016) discusses aspects of marketing management from the aspect of product development showing that affordable and quality products are products that are likely to be chosen by customers.

Fixed Broadband Internet Policy Approaches in Other Countries

Republic of Korea

Korea's telco company has been privatized through the sale of shares by the government. The company is the leading fixed broadband company in Korea. More than 90% of households have access with speeds up to 1Gps. The optical backbone network is operated by several telecommunications companies, internet providers and electric power providers.

Government's Policy:

The Ministry of Science and ICT is the policy maker and since 1980 has pushed for policies to promote ICT and set targets for a certain time. This is the basis

for determining national development strategies such as cyber korea 21 in 1999, e-Korea in 2002, and U-Korea 2005. In 2016, the Korean government issued a medium to long term master plan. This policy issued illustrates how the State took a stand during the era of the Industrial Revolution 4.0 which was marked by the presence of technology such as the internet of things, big data, mobile services, artificial intelligence, and the cloud. This is supported by 4 strategic keys: 1. Development of an intelligent information society by involving the private sector and the community as well as support from the government and the research community. 2. Design and implement a balanced government policy covering technology, industry and a more humanic society. 3. Provision of strategic support to provide security of access rights to IT intelligence and other resources that can convince and support the competitiveness of a more advanced industry. 4. Improving policies and developing national social security based on social consensus.

Malaysia

Sejak awal 1990 perusahaan Telkom Malaysia telah Since the early 1990s the Malaysia's telco company has been privatized. Since then Malaysia's telco has become the leading company as a provider of cable telephone services. However, landline telephones began to decline until 2010, the service was less popular than souvenir phones. This decline was then offset by sales of telephone bundling packages with fixed broadband services. Fixed broadband subscribers have increased, especially when the government launched the Government's High Speed Broadband (HSBB) Project, a form of cooperation with Telkom Malaysia to build optical cable networks in certain areas.

Government policy:

The Ministry of Communications and Multimedia of Malaysia passed the Communications and Multimedia law in 1998. Malaysia became one of the first developing countries to adopt a technology-neutral license that distinguishes between infrastructure, services and content. The National Broadband Initiative document has set a target of 95% to reach broadband in urban areas by 2020 with a speed of 100 Mbps in urban households and 50% in sub-urban and rural areas with a speed of 20 Mbps.

Thailand

Landline penetration has decreased as more users opt for cell phones. Optical Fiber Backbone Network is quite extensive, covering almost all provinces and additional work will be made to increase network density and capacity connecting terrestrial and domestic connectivity using submarine cables along the west and east coast of Thailand.

Government policy:

The Ministry of Economy and Digital Society (MDES) is responsible for IT sector policies. In Thailand's Economic Development and Digital Society policy, it is targeted that all villages can have high-speed internet access for two years and 90% in urban residential areas and economic areas with a speed of 100Mbps for 3 years with service fees that are not more than 2% of GNP per capita.

Strategy for the Acceleration of the Development of Fixed Broadband Access

Ecosystem development is one of the foundations for accelerating the penetration of fixed broadband internet. Several important points to be considered for accelerating the development of fixed broadband access based on existing conditions include:

Increase of Utilization and demand:

Wahid & Iswari (2007) conducted a study on 146 SMEs in Yogyakarta which are engaged in various industrial sectors and found that in general the adoption of Information Technology (IT) by SMEs is still low due to many factors, for example the low need for IT to support their business processes and financial support. The development of the ICT ecosystem in Indonesia needs to be given treatment to accelerate the penetration of fixed broadband internet users in Indonesia in addition to infrastructure development, because the broadband network utilization is still low, with about 12% of home passes that have become home connect. The level of readiness for ICT development in an area must be a common concern for the creation of increased penetration. Based on IP-TIK data in the 2018 BPS Report, the IP-TIK of DKI Jakarta Province is the highest IP-TIK index with a value of 7.61 while Papua is in the lowest position with a score of 2.95.

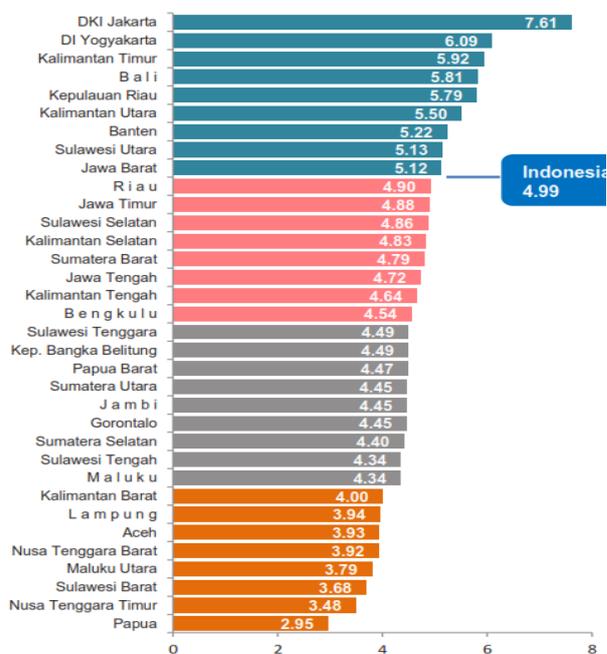


Figure 22. Provincial Development Index - ICT (IP-TIK), 2017

Source: BPS official news, Berita Resmi BPS, Index - ICT (IP-TIK) 2018

This can be used as the basis for determining the priority of regional ecosystem development with high digital literacy so that it is expected to support the acceleration of fixed broadband internet penetration. Ecosystem development can be done through, among others, increasing the capacity of human resources or digital literacy of the community. Increasing understanding and information related to fixed broadband internet must be consistently carried out by conducting massive dissemination and promotion of fixed broadband internet involving all stakeholders. Korsakaite & Lamanauskas (2008) introduced statistical analysis of a number of information and communication technology (ICT) market indicators as a means of developing policies aimed at promoting broadband use. In addition, to create sustainability demand, facilitation and assistance are needed related to productive internet utilization for the community. So that the use of the internet by the community, which was previously based on entertainment experience, has shifted to needs that can improve the quality of life. The promotion of fixed broadband internet can be done by building a community-based group of Indonesian digital content creators by involving popular content creators in Indonesia. (Na, Hwang, & Kim, 2018) stated that digital content has an important role to play in helping the spread of the internet quickly, so countries with less developed economies and low internet penetration need policies that can promote various digital content to anticipate fast internet diffusion. Fixed broadband internet subscribers need to adjust market segmentation considering the potential demand for each region has different characteristics.

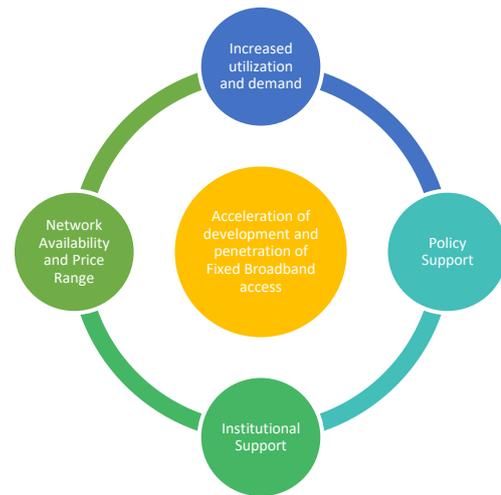


Figure 23. Strategy to accelerate development and penetration of fixed broadband access

Institutional Support:

The development of the ecosystem must also be balanced with massive movements carried out by operators to build telecommunications infrastructure. This can be done by coordinating and harmonizing policies, regulations and ICT programs of the government across sectors, as well as both central and local governments to unite visions in infrastructure development effectively. Cross-sector coordination is needed as a form of institutional support to create an investment climate in ICT and telecommunications. Coordination is carried out by collaborating between the private sector and the government, especially in terms of financing.

Considering several notes regarding national broadband policies in several countries as well as the ICT Development Index in Indonesia, which has various conditions of digital literacy in each region, it is necessary to consider the basics that become the target setting for achieving broadband (especially fixed broadband) and their relevance to the readiness of infrastructure and ICT ecosystem in Indonesia.

Policy Support:

The government plays a role in issuing policies and regulations that can provide a stimulus for fixed broadband internet providers to build infrastructure in each region. So that with this support, it is hoped that infrastructure development will not burden operators which results in high subscription fees. The existing conditions (infrastructure and ecosystem) of the current Indonesia's ICT shall become a consideration in the Presidential Regulation/RPJMN to readjust the achievement of the broadband target in Indonesia with more concrete stages as a guide for related stakeholders to carry out these targets of achievements.

Network Availability and Price Range:

Based on data from the Operational Performance Report (LKO), the achievement of permanent access in 2017 reached 9.38% for households and 9.62% for the population. Support for the provision of fixed broadband access networks must be in line and parallel with policies that can grow the demand for fixed broadband internet. The government together with operators and related stakeholders need to collaborate to reduce the cost of fixed broadband internet services so that they can be reached by many people, especially the eastern region.

CONCLUSIONS

Based on the survey results, followings are the potential demand for areas with different characteristics:

1. **Industrial Area:** potential demand in areas with industrial characteristics is described as coming from individuals and households. Public information/understanding of fixed

broadband internet is still low, even though the communities have a positive interest and perception towards fixed broadband internet. However, as much as 55% of the communities said they were not interested in subscribing;

2. **University area:** Potential demand in areas with these characteristics is described as coming from households (in this case, boarding houses, rented houses). Information/public understanding of fixed broadband internet is quite good. Aspects of interest and positive perceptions of fixed broadband internet are also shared by people in this environment. However, on the aspect of individual subscription decisions, more are not interested in subscribing to fixed broadband internet (51.3);
3. **Tourism Areas:** potential demand in areas with these characteristics can be seen from the place of business (souvenir shops, travel service shops, tour services, tourist services). Information/public understanding of fixed broadband internet is quite good. People's buying interest in this neighborhood is 57.6% more potential, seen from all aspects: interest, positive perception, and decisions.

Utilization of the internet by the community (household, business premises) is mostly for communication and entertainment, so that cellular internet is considered sufficient to fulfil people's needs for internet usage. This is relevant to the results of this survey which states that 87.9% of internet needs are met with cellular internet. Moreover, broadband technology for wireless networks is

increasingly developing, thus increasing public interest in utilizing wireless networks via cellular. Pugh (2019) identified that around 30% of households subscribing to fixed broadband in Australia will consider switching to wireless broadband services, especially since the launch of 5G services and the market position of telecommunications companies will further support the positive perception of wireless services. Apart from technology, high user mobility is the reason for the increase in cellular users (R. A. Wahab, 2013).

There are 3 (three) mostly received reasons of why respondents choose not to subscribe to Fixed broadband internet, namely: 1) There is no necessity for subscription, 2) Lack of Knowledge/Information related to Broadband Fixed internet, and 3) Expensive Prices. In terms of public's willingness to allocate spending for fixed broadband internet shopping, 52.7% said that they cannot afford that, and 40.1% said that they could (pay) 2 (two) times the cost of the internet currently used. Therefore, in the next research, it is expected that future studies can discuss how to increase community accessibility to fixed broadband services.

Recommendations

- To build a strong ICT ecosystem, it is necessary to increase understanding and information related to fixed broadband internet, both through dissemination of information and promotion of massive internet fixed broadband involving all stakeholders.
- The cross-sectoral government facilitates and provides assistance related to productive internet utilization to the community, to grow sustainable demand, build a community-based Indonesian digital content creator group by involving popular

content creators in Indonesia, as well as promoting fixed broadband internet to the public.

- It is necessary for the central and local governments to coordinate and harmonize policies, regulations, and government ICT programs across sectors that are still overlapping to unify the vision for infrastructure development effectively.
- The target of fixed broadband internet subscribers needs to adjust to market segmentation, given that the potential demand in each region has different characteristics.

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