Measuring the Impact of Decline in Leased Line Prices for the Indonesian Economy

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- **Introduction and overview**

Telecommunications provide access and backbone services which affect efficiency and growth across a wide range of industries. The quality and price of such key services shape overall economic performance, as they affect the capacity of businesses to compete in foreign and domestic markets. Reflecting the rapid pace of innovation in information and communications technologies (ICT), competitive market forces are becoming increasingly important in the provision of telecommunication and networking services, definitely moving the sector away from the ''natural monopoly'' market model (World Bank, 2002). International evidence suggests that market openness in telecommunications services and the quality of the regulatory regime are drivers of ICT sector development (OECD, 2000).

This study attempts to assess the impact of decline of leased line prices in Indonesia. It tries to capture this impact through qualitative as well as quantitative impacts. Since the decline in prices occurred recently,[1] the period post the decline is not large enough to do a meaningful time series analysis. However, qualitative assessment is made and the impact is compared with India, where decline in leased line prices led to substantial benefits to user industries. Of particular significance is the trigger to the price decline in Indonesia. The process was set in motion by a presentation of research results by LIRNEasia in Jakarta in October 2005 and culminated with the incumbent operator PT Telkom and others reporting a 69-83 per cent reduction in leased line prices in April 2008[2]. Annex I provides a chronology of the sequence and section 4 in the paper draws interesting comparisons with a similar process in India.

I. Impact of Telecom on Economic Development

Before dealing with the specific situation in Indonesia it will be useful to briefly examine why modern telecommunications is so important for economic development. Most studies by economists conclude that a modern telecommunications infrastructure has a substantial impact on economic growth. Based on samples of 47 and 124 countries, Norton (1992) concludes that in economic development ''a telecommunications infrastructure must be viewed as at least as important as conventional economic forces such as stable money growth, low inflation and an open economy.'' Roller and Waverman (2001) found that one-third of the economic growth in a group of 21 OECD countries over the 20-year period 1970–1990 could be attributed to the direct and indirect impact of the telecommunications sector. James Burnham has studied the amazing economic transformation of Ireland in the 1990s, which owed much of its momentum to timely investment in a modern telecommunications system (2003). The background note of the WTO Secretariat describes telecommunications as essential to the facilitation of international trade, economic development and the enrichment of

[1] Press release of No. 32/DJPT1/KOMINFO/4/2008 showing decline in the tariff of Network Rent towards the decline in the tariff of Internet Access in Indonesia , accessed at http://www.postel.go.id/update/id/baca_info.asp?id_info=946

[2] *Op cit*

citizen's life's (WTO1998). Innovation in telecom has also been linked to growth in electronic commerce and increased accessibility of telecom services are accepted as the foundation of successful national and global society initiatives and the social benefits these initiatives will bestow. And finally, Varoudakis, et. al demonstrate that improving the quality and lowering the cost of telecommunications services holds a key role in improving overall economic performance, especially in developing countries as a result of:

- Better and low-cost telecom services bolster internal efficiency, competitiveness and strengthen the links of developing economies with global markets.
- More competitive telecom markets improve the investment climate, and greatly enhance the attractiveness of liberalizing countries to FDI.
- A low access cost and high-quality telecommunications infrastructure also facilitates the diffusion of the internet and ICT applications. And the spread of the internet holds great promise in helping developing countries catch up more rapidly with the expanding pool of global knowledge
- Developing countries may also be able to successfully position themselves in the global ICT market by nurturing competitive advantage in specific niches—as suggested, for example, by the booming exports of ICT business services and software in countries like India, Israel and Malaysia.

It is well known that telecommunications can create direct as well as indirect benefits. Direct benefits include revenue and employment generation. As with any other form of development, the presence and growth of industries producing telecommunications goods and services is clearly important to the growth of real GDP. Growth results in jobs and revenue. The size of the benefits will of course depend upon the contribution of the sector to GDP and the speed of sector growth. An important indirect benefit through the use of telecom user services is the (impact) increase in productivity. Induced changes result in economic growth and an increase in productivity for businesses and individuals.

At a firm level, it would seem that large firms can afford to invest in telecom infrastructure, but it is also reasonable to assume that such investment would improve efficiency, reduce cost and increase size. This is however an empirical question and would therefore require more micro level indicators and data to understand the underlying factors. The issue is that telecom infrastructure such as leased circuits are 'enabling' or general purpose technologies which implies that their use is ubiquitous yet difficult to measure because they are dominantly indirect. In addition it has been argued that it is not just deployment of infrastructure or technology that matter, but how the technology is used to transform organizations, processes and behavior that is important (John Van Reenen et al. 2005). The push to liberalize leased circuits in the early days of the GATS negotiations was based on the conviction that major benefits could be generated through competitive provision of telecommunications infrastructure, especially leased circuits. These benefits included economic and social and are summarized in Figure 1 below.

Figure 1: Spillover benefits of expanding telecommunications services and networks

Source: Positive network effects of expanding telecommunications services and networks: economic opportunity, growth and social benefits, accessed at http://www.wto.org/english/tratop_e/serv_e/telecom_e/sym_feb08_e/sym_feb08_e.htm

While the government of Indonesia has frequently declared the importance of developing the country's telecommunications sector, typically in statements by the Ministry of Communications and Information (MoCI), the actual priority given to this effort is questionable. As will be shown in this paper, many policy decisions have had the effect of limiting competition thereby restricting the possibility of exploiting the sector as an engine for economic growth. The study offers an assessment of this unrealized potential, and reviews the scope for medium term telecom sector growth. It also offers some estimates of the likely impact of telecommunications liberalization on user sectors and on broader economic performance. Section 2 gives an overview of the telecom sector in Indonesia, including the changes that have recently occurred in the sector. Sections 3 and 4 focus on the leased circuit market in Indonesia and India respectively and compares the two markets especially with regard to pace and sequencing of 'liberalization' in this category. Section 5 examines the empirical linkages between the market for leased circuits and certain user groups and estimates the unrealized growth potential. Section 6 evaluates the benefits from injecting more competition into the market. Section 7 concludes and draws the policy implications of the analysis.

II. Indonesia's telecommunications market

Until 2000, telecommunications services in Indonesia were provided by a succession of state owned enterprises reflecting, in part, the natural monopoly characteristics of the service. In part it also reflected the government's reluctance to involve private participation fully in a sector that provided it with control and cash. It is also possible that complete appreciation of the benefits of competition had not been understood. Thus, since early 1980s, the telecom sector was dominated by two state owned operators, PT Indosat, the exclusive provider of international services and PT Perumtel which operated fixed local and long distance services. In 1991, the latter was partially privatized and reconstituted as PT Telkom. The government created PT Satelindo in 1993 to be the second provider of international service. However, competition was limited since PT Indosat owned 7.5 percent of its shares and PT Telkom 25 percent. Furthermore, PT Satelindo and PT Indosat were required to charge identical tariffs for international service (Goswami, 2006,). In 1994, PT Satelindo and PT Telkomsel were granted a

GSM license. Excelcomindo, a company that the government did not hold shares in, was also given a mobile license in 1996.

The financial crisis of 1997 provided the impetus to reform the sector. The overall programme of telecom sector deregulation was closely linked to the national economic recovery programme supported by the IMF. The telecom reform policy, contained in the MoCIs 'Blueprint' dated July 20, 1999 sought to:

- Increase the sector performance in the era of globalization
- Liberalise the sector with a competitive structure by removing monopolistic controls
- Increase transparency and predictability of the regulatory framework
- Create opportunities for national telecommunications operators to form strategic alliances with foreign partners
- Create business opportunities for small and medium enterprises
- Facilitate new job opportunities[3].

Recent regulatory reforms in Indonesia have their basis in the Telecommunications Law No. 36 of 1999. The law provides key guidelines for industry reforms, including industry liberalization, facilitation of new entrants and enhanced transparency and competition (PT Telkom, Annual Report 2006, submitted to SEC, USA). Under the Indonesian regulatory framework, the Telecommunications Law only outlines substantive principles of the subject matter. Detailed implementation of the law is done, interestingly, by Government regulations, ministerial decrees and decrees of the DGPT. The 'independent' regulatory Authority (Indonesian Telecommunications Regulatory Body, BRTI) created on July 11, 2003, has been given only an advisory role and is dependent on DGPT for budgetary support, resulting in a confusing, multilayered regulatory structure, not conducive to efficient decision making. By the governments own admission "to date, it [BRTI] has been largely inactive and the Ministry of Communication and Information has been more effective in pushing through sector reforms' (Indonesian Trade Policy Review 2007, WTO). Part of the reason for the unrealized potential of telecom in Indonesia must squarely be attributed to the confusing and multilayered regulatory structure. This is discussed later in Section 5.

The telecommunications law classifies telecommunications providers into three categories (BRTI, 2004):

1. Telecommunications Network Providers;
2. Telecommunications Services Providers; and
3. Special Telecommunications providers

Telecommunications Network Providers are the only ones allowed to put up infrastructure. With a Network Provider license, it is possible to provide services for:
(a) Fixed Network: local, long distance, international, and closed user network
(b) Mobile Network: terrestrial, cellular, and satellite

[3] This paper shows that while the policy says the right things, the conditions on the ground even after 17 years deviate significantly from the stated objectives in many respects

As will be argued later the institutional framework does not promote network development. Except mobile telephony, competition is less than adequate in other segments, including in network roll out and development creating a situation of substantial unrealized benefits. This seems surprising since Indonesia is a late starter in telecommunications reform and therefore had the benefit of both technology and policy options to introduce pro competitive regulation in the sector drawing from the experience of already successful markets.

Growth of the Indonesian Telecom market has been uneven. While the mobile market has shown considerable expansion, fixed lines have stagnated in the last two years. It is estimated that fixed lines/100 will decline marginally from 6 to 5.9 in 2008. On the other hand, mobile telephony has grown and surpassed fixed-line penetration since it does not need the same substantial investment in infrastructure. As a result the number of mobile subscribers has increased strongly, rising from 32.8 million in 2004 to an estimated 92 million in 2007, equivalent to access paths/100 of around 37 (Table I).

Table 1
Telecom sector, 2004-08

	2004	2005	2006	2007	2008 (est.)
Telephone main lines ('000)	10,202	12,720	14,295	14,811	14,908
Telephone main lines (per 100 population)	4.3	5.3	5.8	6.0	5.9
Mobile subscribers ('000)	32,873	65,000	85,000	92,000	98,000
Mobile subscribers (per 100 population)	13.8	26.9	34.6	37.0	38.8
Internet users ('000)	8,587	9,885	12,000	14,000	15,500
Internet users (per 100 population)	3.6	4.1	4.9	5.6	6.1
Broadband subscriber lines ('000)	132	325	450	575	690
Broadband subscriber lines (per 100 people)	0	0	0	0	0
Personal computers (stock per 1,000 population)	11	12	13	14	15

Source: TPR, 2007 accessed at www.wto.org

On the other hand internet has not shown extraordinary growth witnessed in mobile. Even if one looks at user numbers, these aggregate between 14-15 million currently, resulting in penetration levels of 6-7%, far below its regional neighbors Malaysia (45%) and Thailand (15%). User numbers, however, present an inflated picture of the reality since users are estimated as a multiple of subscriber numbers. Table 2 presents user and subscriber numbers for Internet since 1998. Two issues are conspicuous in the numbers, one the high multiple of users compared to subscribers[4] and two the relatively low internet subscriber penetration, estimated at a little in excess of 1% for 2008. Broadband penetration is negligible. Reasons for the relatively low internet penetration and negligible broadband penetration are explored later.

[4] *The multiple is inflated according to Goswami (2006)*

Table 2: Internet Subscribers in 000s

Year	Subscribers	Users
1998	134	512
1999	256	1000
2000	400	1900
2001	581	4200
2002	667	4500
2003	865	8080
2004	1087	8587
2005*	1500	9885
2006	1821	12000
2007	2124	14000
2008	2352	15500

*Source: APJII site and updated by author from Trade Policy Review***Error! Not a valid link.**
Conscious of the patchy development of the sector, the government has undertaken important reform of its telecom policy. Over the past decade, a set of first generation reforms allowed private sector and foreign participation, but it was half hearted. The government retained 65% and 16% stake respectively in the country's two main carriers – PT Telkom and PT Indosat, while a license was issued to Excelindo for GSM service. Competition *in* the market remained inadequate and competition *for* the market non existent. The 1999 Telecommunications Law (No. 36/1999), motivated largely by the financial crisis of 1997, created the enabling environment for second generation reforms, which envisages full competition in all market segments. While the second generation reforms have successfully introduced competition in mobile, other sectors remain insulated, with incumbents retaining significant market power. The Government's priorities over the next few years include implementing the provisions of the 1999 law, in particular the development of the regulatory framework that is crucial for the success of the sector liberalization programme.

In 2002, the Government ended the exclusive rights of PT Telkom for domestic long-distance service and local fixed-line service in August 2005 and of PT Indosat and Satelindo for international calling service in 2003. PT Telkom and PT Indosat were established as Indonesia's only full service providers, a move that ensured PT Telkom's survival in the face of increasing competition from Voice-Internet Protocol (VoIP) services. Since 2002, however, PT Telkom has focused most investment in the value-added cellular market and has added few new fixed lines. The provisions of Indonesia's Telecommunications Law have steered reforms to end monopolies and open basic telecommunications services to majority foreign ownership. Thus, Telkom's and

[5] *Before 2002, PT Telkom operated as the exclusive provider of fixed-line local, long-distance, and leased-line telecommunications services. At the same time, in 1995, Telkom awarded 15-year so-called 'KSO' concessions to private consortia to operate fixed line services on a monopoly basis in five of seven regional districts (PT Telkom retained control of Greater Jakarta and East Java). The concessions attracted substantial foreign investment from large international operators, including France Telecom, Media One, Telstra, NTT, Cable & Wireless, and Singapore Telecom. Subsequently, Telkom decided to buy out two of the regional operators, although disputes still exist with two other regional carriers.*

Indosat's respective monopolies on domestic and international services were ended in 2002 as a first step towards introduction of full competition. Competition in fixed-line services has emerged from companies using Voice over Internet Protocol (VoIP) technology. However, the Government has chosen to restrict entry into this new market segment to five companies: Telkom, Indosat, Satelindo, and two independent operators. In terms of number of operators, competition is well-advanced in the provision of mobile services. Telkomsel, jointly owned by PT Telkom and the Singaporean carrier SingTel, is the largest mobile operator, with a market share of over 50%. Its two main competitors are Satelindo, fully owned by Indosat, and Excelcomindo, partly owned by TMI Verizon (Table 3).

The reality as it exists today (see Table 3) however does not suggest any degree of success in meeting the declared objective of introducing 'effective' competition in the sector. In each of the 3 categories (fixed, cellular and international), the Herfindahl Hirschman Index (HHI) exceeds 1800[6], implying, according to the US applied benchmark that the market is 'presumptively anti competitive'. Even if a lower benchmark is applied, say 2500 (the HHI that would obtain with 4 operators of equal size in the relevant market), it would still 'raise serious doubts' in regard to the extent of competition in the market. An alternative analysis using the CR4 ratio i.e. the sum of the market shares of the top 4 firms produces poorer results with respect to competition in the Indonesian telecom market. .

Table 3: Telecommunications market shares in 2006 (Per cent)

Type	Operator	Share	HHI	CR4
Fixed phone	Telkom	90	**8182.75**	**100**
	Indosat	2		
	BakrieTel	5		
	BB Tel	2		
Mobile	Telkomsel	54	**3650**	**96**
	Indosat	26		
	Excelcom	14		
	Mobile-8	4		
	NTS	<1		
	Mandara	<1		
	Hutchinson	<1		
	Primasel	<1		
International	Telkom	52	**4148**	**90**
	Indosat	38		

Source: TPR 2007 and author calculations

There are no limitations on entry for the provision of Internet services. So far, the Government has licensed 190 Internet service providers (ISPs), of which only 35 are active (TPR 2007). Provider specific data is not available, however both PT Telkom, through TelkomNet, and PT Indosat, through IndosatNet, are strong players in the market for Internet services suggesting a concentrated market in the provision of Internet services as well. In addition, ISPs are not allowed to operate their own international Internet gateways, but are required to use the facilities of Indosat or Satelindo.

[6] *HHI is the sum of squares of market shares of all providers in the relevant market.*

The Indonesian Telecommunications Regulatory Agency (BRTI), an independent telecommunications regulatory body, was formed in July 2004 to improve transparency in regulation, development and dispute resolution. Interviews with stakeholders in Jakarta revealed that BRTI at the present time is functioning as an advisory body to DGPT, which in turn performs, *inter alia* the task of economic regulation. The problems associated with such a structure are discussed in a subsequent section.

Indonesia, like many developing and developed countries, has chosen a gradual approach to reform of telecommunications services. Partial privatization, the opening of selected service segments to competition (provision of mobile and internet services) and the phasing in of individual regulations has been preferred to a strategy of radical sector liberalization with the immediate adoption of comprehensive pro-competitive regulations. This paper argues that as a result of this approach, a number of benefits that could have been realized especially by introducing competition in the provision of leased circuits have been delayed or denied to the Indonesian economy. The opportunity loss for the economy has therefore been considerable. A comparison is made with the benefits secured by India as a result of inducing decline in the prices of leased circuits through a combination of regulatory intervention and pro competitive policy.

III. The Leased-Line study of 2006 and its impact

It is now commonly accepted that availability of leased circuits in a timely and cost effective manner can have significant spillover benefits to user groups[7]**.** It was this premise that motivated a study of leased line prices and its impact on the internet market in Indonesia. The findings of that study expectedly sparked considerable interest and media coverage[8,9].

The study showed that inadequate supply of backbone and leased line infrastructure and the corresponding high prices far exceeding benchmark prices in other countries by as much as 48 times forced ISPs to use Wi-Fi as low-capacity backhaul networks to carry Internet traffic. The price diparity was much higher for international leased circuits compared to domestic leased circuits (See Tables 4 and 5). The consequence of the high prices was along familair lines. It forced Internet access prices to be high and compelled ISPs to innovate, thus substituting away from high priced leased circuits to Wi-Fi solutions to deliver such services, albiet illegal at times, to customers.

Table 4: Comparison of Annual Domestic Leased Line Prices: Indonesia, India, and EU Benchmark (2005)

	2 Mbps Link	
	2 km	200 km
Indonesia	USD 18,000	USD 45,000
India	USD 376	USD 7,603

[7] *World Telecommunications Development Report, ITU, 2006*

[8] *Wi-Fi "Innovation" in Indonesia: Working around Hostile Market and Regulatory Conditions*by Divakar Goswami & Onno Purbo, accessed at http://www.lirneasia.net/projects/completed-projects/indonesia-wifi/

[9] *Media coverage accessed at http://www.lirneasia.net/2005/10/findings-from-lirneasia-project-covered-by-indonesian-papers/*

EU benchmark	USD 4,802	USD 9,219
Ratio of Indonesian to Indian price	48:1	6:1
Ratio of Indonesian to EU benchmark price	44:1	5:1

Source: Goswami and Purbo (2006)

Table 5: Comparison of Annual International Full-Circuit Prices to US West Coast in India and Indonesia: Prices (USD) and Price Ratios

	Full Circuit
	2 Mbps
PT Indosat (Indonesian incumbent)	USD 108,528
DT Putra(Indonesian satellite provider)	USD 146,400
India	USD 37,200
Ratio of PT Indosat to India price	3:1
Ratio of DT Putra to India price	4:1

Source: Goswami and Purbo (2006)

According to the study, non-independent regulation coupled with a non-competitive market environment for telecommunication services were among the primary reasons for for high leased line prices and consequently of low penetration of Internet in Indonesia. The policy recommendations that followed revolved around introducing credible regulatory reform and price control in the markert for leased circuits. The recommendations however, must be seen not merely in terms of the benefits of introduction of competition in the sector, but also in terms of their impact on economic prosperity and thus quality of life by enabling people to cooperate, transact and communicate locally and long distance. A closer look at Indonesia reveals striking disparities in access and connectivity between cities and rural areas, some of which remain deprived of any telecommunication infrastructure.

IV. Leased Line Prices in India and their Impact

Before going on to assess the impact of leased line prices in Indonesia, it may be useful to draw some lessons from the Indian experience in this regard. The reasons for benchmarking with India are two fold. One, the Goswami and Purbo (2006) study referred to earlier also benchmarked Indonesian leased line prices with those prevailing in India, and two, the Indian experience suggests that prices can be regulated (reduced) even with sizeable political economy constraints.

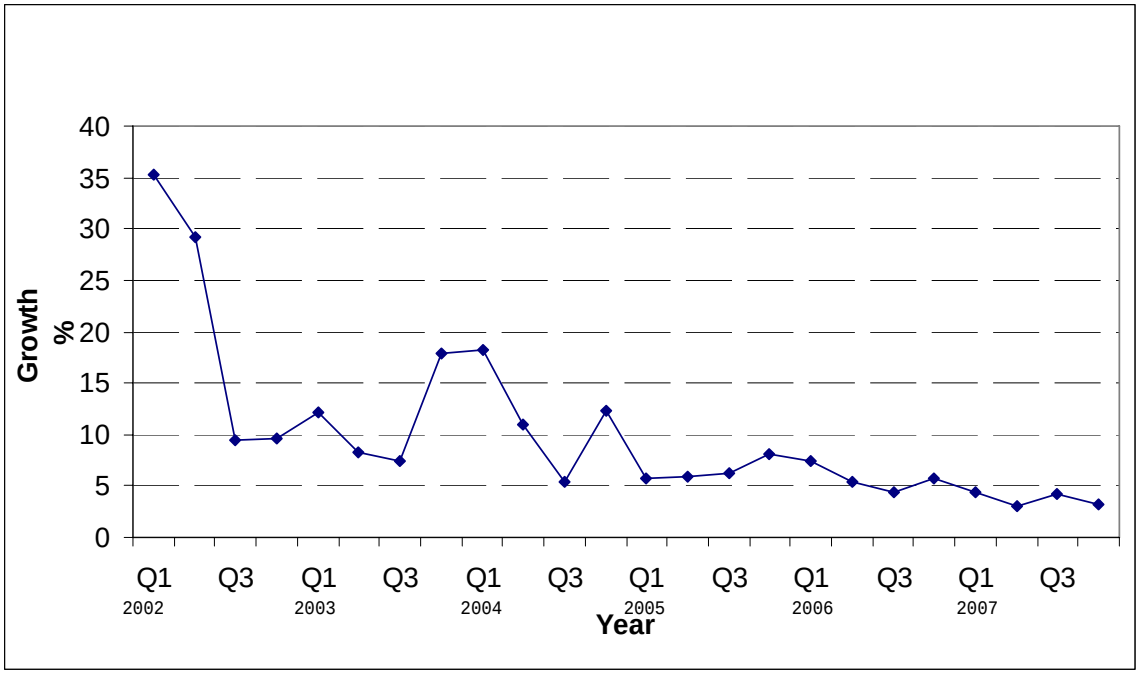
In the monopoly regime of the 1990s, leased circuit prices in India were singularly high and there was no attempt to rationalize these since supply was controlled by the Department of Telecommunications (DoT), who in addition performed the role of licensor and regulator. The creation of the regulator, Telecom Regulatory Authority of India (TRAI) in 1998 and the introduction of competition in the sector reflected a new beginning for telecom in India. One of the first markets subject to regulatory intervention was the market for leased circuits because of the envisaged pro-competitive impact such regulation could have on the sector and beyond. Thus, TRAI stated 'leased line tariffs should be cost oriented in order to stimulate economic activity and efficiency,

competition and quality of service" (TRAI, 1998). Interestingly, the need to rationalize leased circuit prices the first time round was driven by an enlightened TRAI, rather than industry which however participated vigorously in the second round of price cuts of leased circuits in 2005[10].

TRAI initiated a Consultation process with a view to fixing the price ceiling for Domestic Leased Circuits (DLC). The downward revision was based on the rationale that the high prices i) discourage other operator to lease lines ii) imply a loss in revenue for the incumbent iii) result in over investment in the network and most importantly iv) constrain economic activity that relies on or is linked to the use of leased lines. The reduction proposed in 1999 was massive and ranged between 67 to 95 per cent depending upon capacity and distance. Table 6 shows that price ceiling for leased circuit was set at US dollar 2,207 for a 64kbps circuit for more than 500 km, reflecting a 93 per cent decline from the prevailing levels. Similar reductions were made for leased lines across different capacities and over various distance slabs. The two most vocal opponents to the price revision were the incumbent and the VSAT association representing the interests of the VSAT industry. The incumbent opposed the decline fearing erosion of profit as a result of allowing cost based access to its network by competitors of downstream services. Revenue from leased circuits itself comprised less than 2 per cent of the incumbent's revenues, so the direct impact of the reduction could not have been a reason for the reluctance to reduce prices. It was therefore only attempting to create an entry barrier for new players. But it is to the credit of TRAI the revision was effective and implemented in March 1999. The opposition from VSAT owners stemmed from diametrically opposite reasons. They pled that reduction of the magnitude proposed by TRAI would render their industry unviable, since, according to them demand for VSAT was due to 'high' leased line prices. Lowering prices would encourage users to shift to leased circuits, thereby destroying the VSAT industry. Not only did the VSAT industry 'survive' the first round of price cuts, it is prospering even after a second round of price cuts implemented by TRAI in November 2005. There are 8 VSAT service providers and more than 70,000 VSAT subscribers in India currently and the rate of growth of the industry quarter on quarter since 2002 has been respectable (See Chart 1). The lesson from this experience is for regulators to eschew intervention that artificially promotes any technology or platform. The telecom industry is highly capital intensive and its returns highly sensitive to regulation. The cost of bad regulatory decisions has to ultimately be borne by consumers in terms of high prices or poor quality of service or both. In case VSATs were to become 'extinct' in India as the industry lobby forecast in the face of falling leased circuit prices, so be it. As it happened it was not to be, and one can only assume that either the industry association got it wrong or that it was a deliberate ploy to mislead the regulator into garnering advantage for itself!

Chart 1 Rate of Growth of VSAT Subscribers 1st Quarter 2002 to 4th Quarter 2007

[10] *Support for reducing leased circuit prices from Industry bodies like Internet Service Providers Association of India (ISPAI) and NASSCOM figured prominently in 2004-05, presumably after gaining an appreciation of the consultative process of tariff formulation. See for instance TRAI Consultation Paper – Revision of Ceiling Tariff for Domestic Leased Circuits 22nd June 2004 and TRAI Consultation Paper – Consultation Paper to promote competition in IPLC in India 6June 2005.*



The benefits of affording access to competitors to an essential facility (leased circuit) derive not only from regulation induced price declines but also from competition in the supply of services to final users and the stimulus to dynamic efficiency that is provided by the competition. This was the basis of the TRAI proposal and it withstood pressure from the incumbent as well as the VSAT association to implement its agenda for reform.

Table 6: Trends in Domestic Leased line tariffs (for highest distance slab i.e. > 500 km) for the Incumbent

US Dollars per annum 1998-2005				
Year	**Capacity**			
	64Kbps	**2Mbps(E1)**	**DS-3**	**STM-1**
1998	33,043	157,885	3,315,582	9,946,745
1999*	2,207	50,586	1,062,313	3,186,940
2000	2,053	47,059	988,235	2,964,706
2001	2,003	32,137	674,875	2,024,624
2002	1,994	31,990	671,791	2,015,372
2003	2,106	33,779	608,028	1,824,084
2004	2,183	20,009	420,191	1,260,573
2005	2,103	19,281	404,908	1,214,724
November 2005 *	986	19,041	137,970	370,072

**Regulatory price revision implemented*

The tariffs specified by TRAI were in the nature of caps and operators were free to offer discounts to their customers on a non-discriminatory basis. The price changes however were few as Table 7 shows, since BSNL was the dominant supplier and although

competition in terms of suppliers existed, it was not effective. Moreover, the incumbent retained "near monopoly power" in the local segment due to the greater coverage of its network compared to new entrants, who generally had to rely on slower wireless transmission to provide local connectivity (TRAI 2004). This prompted a second review of leased line prices, initiated by TRAI in 2004 and implemented in November 2005.[11] The announcement of the review provoked the incumbent into cutting prices in 2004, with the highest reduction coming in the circuits for which demand was strongest (E1). Finally the second (and last) revision of the ceiling was implemented in November 2005 across various capacities and over distance slabs. Table 7 shows that significant reductions were made except for E1 which was subject to greater competitive pressure. Table 8 shows that competition in the DLC market in India has now materialized, obviating the need for further intervention by TRAI in price setting. *In fact interviews with service providers and TRAI officials reveal considerable excess supply of domestic leased circuits with operators willing to provide such circuits at aggressive prices.*

Table 7: Percentage change (%) in Domestic Leased line tariffs

Year	Capacity			
	64Kbps	**2Mbps(E1)**	**DS-3**	**STM-1**
1999	-93%	-67%	-67%	-67%
2000	0%	0%	0%	0%
2001	0%	-30%	-30%	-30%
2002	0%	0%	0%	0%
2003	0%	0%	-14%	-14%
2004	0%	-43%	-33%	-33%
2005	0%	0%	0%	0%
November 2005	-54%	-3%	-67%	-70%

Table 8: Number of Service Providers (SP) in Domestic Leased Line

Year	No. of SPs	Name of Service Providers
1998-99	One	BSNL
2000-2008	Eight Plus IP-II	BSNL, Tata , Bharti, Hughes, Reliance, Shyam Telelink, HFCL and IP-II Service Providers.

IP- Infrastructure Providers such as Railways, Power Utilities and Gas Utilities

The other market which is complementary to the DLC market and has an equally fundamental impact on downstream services such as Internet and Information Technology enabled services (ITES) is the market for International Private Leased Circuits (IPLC). It is a dedicated point to point connection providing a non-switched, fixed and assured bandwidth between two points, one being in the home country and the second in a foreign country. IPLC services in India are available for speeds ranging from 64 kbps to 155 mbps. Broadly speaking, the IPLC is divided into far end and near end

[11] *TRAI Consultation Paper – Revision of Ceiling Tariff for Domestic Leased Circuits 22nd June 2004.*

termed as half circuit. The tariff for the far end is dependent upon mutual negotiations between the foreign carriers with their Indian counterparts. Until 2005, the tariff for near-end half circuit IPLC was forborne.

Through a review conducted, TRAI determined that effective competition had not emerged in the IPLC business segment until 2004, even after 6 years of sector liberalisation. The reasons were not difficult to fathom. Bharti Telesonic Ltd. was the only other provider of IPLC in addition to Videsh Sanchar Nigam Ltd. (VSNL), the incumbent operator. TRAI, consequently, received a number of submissions by stakeholders that adequate capacity of bandwidth was not being provided and the capacity being provided was extremely high-priced (TRAI, 2004). In their representation they stated that bandwidth prices in India were not competitive and the prices for a 2Mbps link were higher than international norms and that this differential increased

Table 9: IPLC (Half Circuit) Tariff for US from 2000 to 2008 (US dollar per annum)

Year	Capacity		
	E1	**DS3**	**STM1**
1998	413,631.02	-	**-**
1999	404,690.73	-	**-**
2000	342,245.99	6,203,208.56	17,967,914.44
2001	333,889.82	6,203,208.56	17,529,215.36
2002	54,009.14	979,019.53	2,835,479.85
2003	67,558.68	1,033,779.34	2,994,077.65
2004	53,888.13	1,011,823.56	2,808,094.59
2005	44,390.89	790,753.72	2,191,717.79
Nov-05	28,483.79	227,870.29	655,127.08
2006	26,209.68	209,677.42	602,598.57
2007	25,158.19	201,366.74	578,840.80

Source: TRAI and author calculations based on prevailing market exchange rate

significantly for higher capacities (45 Mbps (DS3) and 155 Mbps (STM1)). This can be seen from Table 9. The data also shows that prices for IPLCs in 2001 and earlier were astronomical by any standard and the ratio of prices for E1:DS3:STM1 defied the principle of economies of scale. One can only attribute the level of prices to the existence of an unfettered monopoly. The first signs of tariff reduction came in 2002, after Tata acquired the incumbent VSNL. During this time the global leased line market was also experiencing excess capacity, intense competition and technological development. Table 10 shows that prices fell by 84% across the board; however they still remained significantly above international benchmarks (TRAI 2004).

Intervention therefore became necessary not only for rationalizing the tariff structure but to also ensure that Indian growing prowess in the Information Technology enabled services (ITES) was not constrained. Software exporters, BPO industries, banks and other financial services companies are key users of IPLCs and the competitiveness of these industries in the global market is dependent to a large extent on the price they pay for IPLC. In addition, Internet Service Providers (ISP) also use IPLC for their upstream

connectivity abroad and high cost of IPLC's get reflected into the Internet access tariff which could adversely affect Internet growth in the country.

Table 10: Percentage decline in IPLC prices

Year	Capacity		
	E1	**DS3**	**STM1**
1999	-2%	-	-
2000	-15%	-	-
2001	-2%	-	-
2002	-84%	-84%	-84%
2003	25%	6%	-89%
2004	-20%	-2%	-6%
2005	-18%	-22%	-22%
Nov-05	-36%	-71%	-70%
2006	-8%	-8%	-8%
2007	-4%	-4%	-4%

Source TRAI and author calculation

The prevailing IPLC prices in India are extremely competitive and compare favorably with EU benchmarks (See Charts 2, 3 and 4). Although there are only three providers, TRAI has recommended introduction of re-selling in the IPLC market (TRAI 2006). Resale is "the sale or lease on a commercial basis, with or without adding value of telecommunication services from a telecommunication carrier". Resale is the modality for optimizing the resources in the sector by facilitating make or buy decisions. It is an important strategy for many new entrants, especially in the short term when they are building their own facilities. Resellers or non facility based service providers are introduced to enhance competition. In the context of resale in IPLC segment, the reseller would provide International bandwidth on demand and could disaggregate higher capacity into smaller denominations, thus concentrating on their ability to reach out to new customers.

Chart 2: Price comparison for India and Europe 2mbps

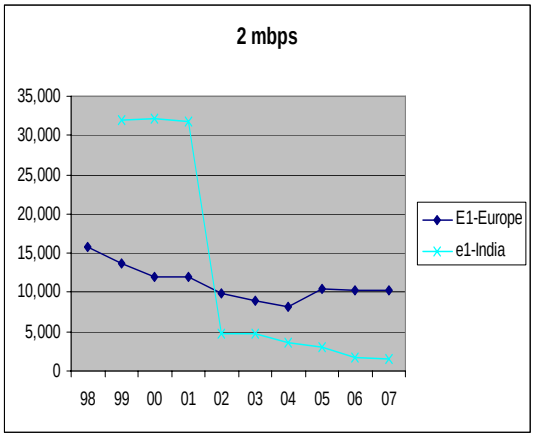


Chart 3: Price comparison for India and Europe 45mbps

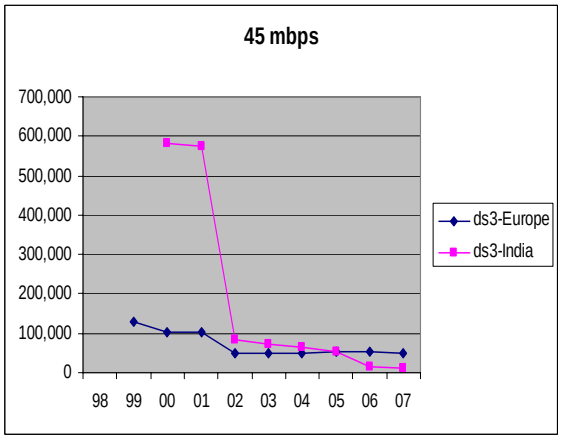
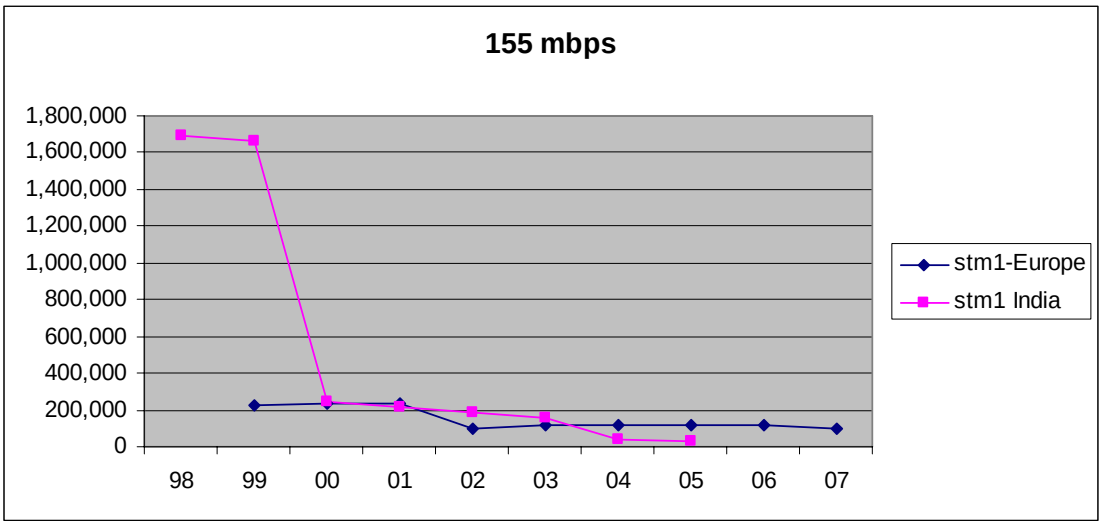


Chart 4: Price comparison for India and Europe 155 mbps



Some experts question the efficacy of reselling since it detracts from facilities based competition. Ideally, competitors would put an end to the incumbents' monopoly by building their own networks. But building a competing network with the same reach is hugely expensive and time-consuming. By allowing competitors to lease or resell lines, regulators have been able to foster competition in the market. However, objections stem from the fact that it may inhibit investments that competitors might otherwise have made. In the debate between reselling and facilities based competition, the Indian experience suggests that reselling is likely to have the most impact after sufficient network capacity has been created by supply side competition.

Table 11: Number of Service Providers in IPLC

1998 to 2003	One	VSNL
2004	Two	VSNL and Bharti
2005	Three	VSNL, Bharti and Reliance

Table 12: Highlights of the IT-BPO sector performance in FY 2007-08
IT Industry-Sector-wise break-up

USD billion	FY2004	FY2005	FY2006	FY2007	FY2008 E
IT Services	10.4	13.5	17.8	23.5	31.0
-Exports	7.3	10.0	13.3	18.0	23.1
-Domestic	3.1	3.5	4.5	5.5	7.9
BPO	3.4	5.2	7.2	9.5	12.5
-Exports	3.1	4.6	6.3	8.4	10.9
-Domestic	0.3	0.6	0.9	1.1	1.6
Engineering Services and R&D, Software Products	2.9	3.8	5.3	6.5	8.5
-Exports	2.5	3.1	4.0	4.9	6.3
-Domestic	0.4	0.7	1.3	1.6	2.2
Total Software and Services Revenues	16.7	22.5	30.3	39.5	52.0

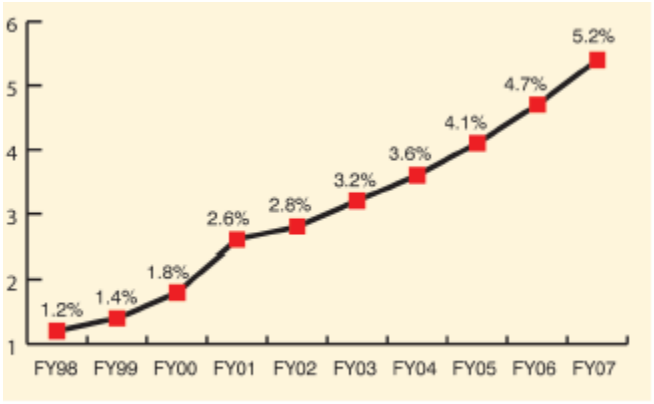
Of which, exports are	12.9	17.7	23.6	31.3	40.3
Hardware	5.0	5.6	7.1	8.5	12.0
-Exports	n.a.	0.5	0.6	0.5	0.5
-Domestic	n.a.	5.1	6.5	8.0	11.5
Total IT Industry (including Hardware)	21.6	28.2	37.4	48.0	64.0

N.A.: Not available Note: Figures may not add up due to rounding off. Source: NASSCOM

DLC and IPLC markets in India have experienced astonishing price decreases and the prevailing tariffs have been cited as benchmarks in comparative tariff studies (Goswami, 2006). What is instructive is the manner in which the price decline occurred. In both markets, regulatory intervention was necessary to start with but competition was as much necessary to ensure that cost reductions through technical progress were passed on to the customer. TRAI also overcame the incumbents' procedural, legal and technical reasons for tardiness[12]. A lack of competition-boosting oversight is one reason for the poor record of Indonesia in this regard (see below). Most Indian companies using DLC and IPLCs, including ISPS have a choice of at least three International bandwidth providers and many more domestic leased line providers. Competition therefore ensures that providers race to offer their customers better and faster access at increasingly attractive prices.

The benefits of lowered leased line prices have been felt in other industries, especially ITES. IT-ITES comprises 5.2 per cent of GDP (see Chart 2) and is expected to grow to 64 billion dollars in 2008 (See Table 12).

Chart 5: Share of IT-ITES in GDP



Source: NASSCOM Strategic Review 2007, NASSCOM

Box 1 highlights the many drivers for the good performance of IT in India, and importantly credits cost effective availability of telecom infrastructure as a key reason. This has been supported by other evidence available from Banking Finance and Accounting (F&A), Customer Interaction Services (CIS), Human Resource Administration and niche business services. According to NASSCOM,.."with significant bandwidth capacity lying unutilized and the steady advancement in technology making access faster and less expensive than before, it is likely that the share of telecommunications in the cost structure of an IT-BPO firm may further decline. Firms

[12] See Kathuria (2007)

are also managing to lower their facilities costs by expanding into other tier-II locations"[13]. In addition, Output and Employment Multipliers for Disaggregated Services Sectors estimated by UNCTAD show that among 15 services sectors the output multiplier is highest for software services, i.e. 4.36 (Table 13). This implies that for every increase in sectoral output by 0.1 million rupees there will be an increase in total output by 0.43 million rupees. This is followed by medical and health services (3.89); hotels and restaurants (3.85); communication services have an output multiplier of 3.15 and an employment multiplier of 2.63. This implies that the aggregate direct and indirect employment change, in absolute number, resulting from the increase in demand worth 1 million rupees of output of the sector will be 2.63 million. Employment multipliers are found to be greater than 3 for public administration, education and research and wholesale and retail trade.

Table 13 Output and Employment Multipliers for Services Sectors in India

S No	Sectors	Output Multipliers	Employment multipliers
1	Hotels and restaurants	3.85	4.27
2	Public administration	3.52	3.50
3	Education and research	3.51	3.42
4	Trade	3.19	3.13
5	Storage and warehousing	3.64	2.85
6	Railway transport services	3.8	2.69
7	Medical and health	3.89	2.65
8	Communication	3.15	2.63
9	Tourism	3.74	2.57
10	Other services	3.3	2.47
11	Ownership of dwellings	2.91	2.38
12	Other transport services	3.37	2.37
13	Banking	3.19	2.33
14	Insurance	3.08	2.14
15	Software	4.36	1.27

Source: UNCTAD 2008

Evidence for India demonstrates the importance of credible regulatory intervention and competition in driving prices of DLCs and IPLCs to reflect their true cost. In doing so, substantial benefit has been reaped by user industries such as IT and BPOs. In addition, analysis by the Confederation of Indian Industry National Broadband Economy Committee shows that the total present value (2004) of benefit to the Indian economy due to growth from broadband is expected to be US$90 billion for the years 2010 – 2020, with an 11% additional growth in labor productivity. Broadband growth is, inter alia, contingent upon availability and price of infrastructure. According to CII this activity is expected to launch new business lines and increased efficiency in existing businesses, leading to direct employment of 1.8 million and total employment of 62 million by 2020.

[13] Indian ITES-BPO Industry : NASSCOM Analysis, 2007

Box 1: Key Growth Drivers of Indian ITES-BPO Exports

- **Abundant Talent**- India's young demographic profile is an inherent advantage complemented by an academic infrastructure that generates a large pool of English speaking talent. Talent suitability concerns are being addressed through a combination of government, academia and industry led initiatives. These initiatives include national rollout of skill certification through NAC (NASSCOM Assessment of Competence), setting up finishing schools in association MHRD to supplement graduate education with training in specific technology areas and soft skills and MoU's with education agencies like UGC and AICTE to facilitate industry inputs on curriculum and teaching and develop faculty development programme.
- **Sustained cost competitiveness**- India has a strong track record of delivering a significant cost advantage, with clients regularly reporting savings of 25-50 percent over the original cost base. The ability to achieve such high levels of cost advantage by sourcing services from India is driven primarily by the ability to access highly skilled talent at significantly lower wage costs and the resultant productivity gains derived from having a very competent employee base. *This is further complemented by relative advantages in other elements of the cost structure (e.g. telecom) that contribute to India's cost competitiveness – even when compared to other low-cost destinations*.
- **Continued focus on quality**- Demonstrated process quality and expertise in service delivery has been a key factor driving India's sustained leadership in global service delivery. Since the inception of the industry in India, players within the country have been focusing on quality initiatives, to align themselves with international standards. Over the years, the industry has built robust processes and procedures to offer world class IT software and technology related services.
- **World class information security environment**- Stakeholders of Indian BPO recognise fool proof security as an indispensable element of global service delivery. Individual firm level efforts are complemented by a comprehensive policy framework established by Indian authorities, which has built a strong foundation for an 'info-secure' environment in the country. These include strengthening the regulatory framework through proposed amendments to further strengthen the IT Act 2000, scaling up the cyber lab initiative, scaling up the National Skills Registry (NSR) and establishing a self regulatory organisation.
- **Rapid growth in key business infrastructure**- Rapid growth in key business infrastructure has ensured unhindered growth and expansion of this sector. *The BPO sector has been a key beneficiary with the cost of international connectivity declining rapidly and service level improving significantly. The growth is taking place not only in existing urban centres but increasingly in satellite towns and smaller cities. Critical business infrastructure such as telecom and commercial real estate is well in place; improving other supporting infrastructure a key priority for the government. STPI infrastructure available across the country and magnitude of investments shows government support to the industry.*
- **Enabling Business policy and Regulatory environment**- The enabling policy environment in India was instrumental in catalyzing the early phases of growth in this sector. Policy makers in India have laid special emphasis on encouraging foreign participation in most sectors of the economy, recognising its importance not only as a source of financial capital but also as a facilitator of knowledge and technology transfer. The Indian ITES-BPO sector has benefited from this approach, with participating firms enjoying minimal regulatory and policy restrictions along with a broad range of fiscal and procedural incentives.

Source: Nasscom 2007 ***Indian ITES-BPO Industry – Fact Sheet*** (*Emphases added)*

V. Leased Line Prices in Indonesia

The foregoing analysis has shown the positive impact of telecom sector development, especially leased line price decline in India. A combination of regulatory intervention and competition were identified as the key instruments to have made it possible. This section attempts to capture the impact, or lack thereof, for Indonesia.

Table 14: GDP AT CURRENT MARKET PRICES (in billion rupiah)

YEAR	GDP	Communications	%
2003	2,013,674.60	39380.9	1.96%
2004	2,295,826.20	53981.7	2.35%
2005	2,784,960.40	70697.5	2.54%
2006	3,338,195.70	87941.6	2.63%

Source: National Income for Indonesia 2003-2006 Badan Pustak Statistik

The communications sector in Indonesia accounted for 2.63% pf GDP in 2006, while telecommunications is estimated to be about 75% of that (the rest attributable to post and telegraph), making it roughly about 2% of GDP. The governments target for telecom sector revenue for 2009 is 100 trillion rupiah, and if GDP continues to grow at the current rate of 6.3 per cent in real terms, telecom sector share in GDP will remain stagnant at about 2%. This is considerably below the world average of 3.1 per cent[14], demonstrating significant potential for the sector. If sector contribution can rise to 5% (Thailand, Vietnam and Malaysia are close to achieving 5%, see Table 15), at current levels of GDP this would imply sector revenue of 200 trillion rupiah, roughly double the forecasted amount for 2009. Although this may sound implausible at this stage, given that large parts of Indonesia are unconnected and most of the telecom infrastructure is concentrated in Java and Sumatra, appropriate regulatory intervention and institutional design could go a long way towards bridging the gap. This report argues that tariff rationalization and credible regulation will be a major determinant in this regard. And if successful, substantial multiplier effects as in the case of India can be realized[15].

Another distinctive feature that emerges from Table 15 is the poor diffusion of internet and broadband in Indonesia, even when compared with the low penetration rates of

[14] *World Telecommunication Development Report, 2006, International Telecommunication Union (ITU)*

[15] *Vast stretches of India have been deprived of telecoms infrastructure, a fact acknowledged by TRAI in its Consultation Paper on Infrastructure sharing, resulting in a digital divide. While telecoms share in GDP for India is lower than in Indonesia, the share of IT ITES is disproportionately high. Some benefits of telecom liberalization in India have therefore accrued further up in the value chain in IT-ITES sectors, which now accounts for more than 5% of GDP. The rapid rise of the Indian IT-ITES sector over the past decade has contributed to the revenue aggregate of this sector growing by nearly ten-fold and has also catalysed a wider socio-economic transformation in the country – through strong linkages with other sectors of the economy. These include backward linkages with sectors that support and feed into the IT-ITES sector, such as telecommunications and forward linkages with sectors that use IT and ITES. For example, consumption spending on housing, food items, durable goods and holidays etc. generated additional output of Rs 290 billion (about US $6.5 billion) in 2006-07. While the IT-ITES sector provides direct employment to 1.3 million people, it creates additional employment for 5.2 million people (Nasscom 2008). See Chart 5 and Box 1 above as well.*

India. Indonesia out performs India by a wide margin in fixed and mobile telephony and prima facie one would expect it to perform better in internet and broadband as well. It is therefore somewhat surprising that Indonesia fares worse in broadband and internet. Inevitably, the reasons for this poorer performance must be due to the high prices of leased circuits which translate into high prices for internet and broadband, thereby affecting demand. This was explored in the Goswami 2006 study which found Indonesian leased line prices to be much higher than Indian and European prices (see Tables 4 and 5 above). Innovative solutions were adopted by entrepreneurs such as Wi-Fi for access and back haul, but these were limited in their geographical coverage to high density neighborhoods in urban areas and could not be relied on to solve the internet puzzle for the country. The authors themselves assert Wi-Fi adoption in Indonesia to be a temporary and suboptimal solution to increasing internet diffusion. This is because Wi-Fi is prone to interference and does not provide carrier class reliability. ISPs adoption of Wi-Fi was forced due to the high cost of backbone infrastructure.[16]

High prices for infrastructure, such as leased circuits, are a symptom of a known problem i.e. market failure. The source of the market failure was, and continues to be the domination of the incumbent, PT Telkom in the market. Table 16 provides evidence for this. In 2003 the share of PT Telkom in telecom sector revenue was 92% and although it has declined to 78% in 2006, it needs to fall much more to reduce its domination in the market. At the current rate of decline, PT Telkom's share will fall to 73% by 2009; nowhere near the share needed to achieve a competitive market in telecom. By contrast the corresponding figure for the Indian incumbent BSNL is 39 per cent. The decline in BSNL's share in total sector revenue has been swift due to the fact that once private sector entry was allowed into the telecom sector, the incumbent had to contend with stiff competition in all sub sectors. The last source of BSNL's monopoly, domestic long distance (DLD) was removed in 2002. In contrast, Indonesian reforms have been tentative at best and PT Telkom retains market power in all segments that it operates[17].

Table 15: Summary Indicators in Select Countries

Country	Internet subscribers per 100 inhabitants, 2007	GDP per capita US $, 2006	GDP per capita, PPP (current international $), 2005	Broadband as a % of Internet subscribers, 2007	Tele-density Fixed (Lines per 100), 2007	Mobile tele-density (SIMs per 100), 2007	Tele Rev/GDP, 2005
China	11.31	2096	6757	44	27.5	41.2	6.6
India	1.15	813	3452	23	3.4	19.98	1.9
Indonesia	1.13	1616	3843	9	7.7	35.33	2.2
Malaysia	18.56	6051	10882	27.7	16.4	87.9	4.8
Philippines	2.37	1392	5137	48.4	4.3	50.8	4.4
Thailand*	n/a	3185	8677	n/a	11	80.4	3.1
Vietnam	6	627	3071	24.4	32.7	27.2	4.7

* data on internet subscriber for Thailand is not available

[16] *See page 152, Goswami Wi-Fi the Network Fix*
[17] *Ibid*

Data Source: http://www.itu.int/ITU-D/ICTEYE/Indicators/Indicators.aspx#, and World Development Indicators, 2007 and *WDR: 2008, Agriculture for Development, World Bank, WTDR, 2006 and individual regulator web sites*

Another reason for the high leased-line prices found in the Goswami study owe to the small share of revenue contributed by leased circuits to PT Telkom's bottom-line. In 2006, the share of leased-line revenue in PT Telkom's total revenue was a meager 1.4%. Even in the preceding years for which data is available the ratio is very small (See Table 17). The fact that leased circuits contribute a miniscule portion of the revenue coupled with the perception that leasing lines to other telecommunications operators facilitates competition in downstream markets against itself, may have led to PT Telkom being unaccommodating to other providers' requests. In fact an interview with PT Telkom revealed as much, and also the fact that their own requirement for building infrastructure precluded leasing to others.

This situation should have made for an irrefutable case for regulatory intervention to break the stranglehold of the incumbent in the leased circuit business. Instead it took an inspired piece of research from LIRNEasia and continuous pressure from stakeholders such as MASTEL and the media to show the unreasonableness of leased line prices in Indonesia. When the findings were made public, it jolted the institutional machinery into reviewing prices and subsequently MoCI decided that regulatory intervention was necessary for leased circuits.

Table 16: Share of the Indonesian Incumbent in total sector revenue (Billion Rupiah)

Year	Telecom Sector Revenue	Operating Revenue	Share of PT Telkom in Sector Revenue
2003	29535.675	27116	92%
2004	40486.275	33948	84%
2005	53023.125	41807	79%
2006	65956.2	51294	78%

Source: *National Income for Indonesia 2003-2006 Badan Pustak Statistik and PT Telkom Annual Report 2006*

The process was set in motion and a cost-based model for leased lines was developed by BRTI and notified by the Ministry in March 2007[18]. Based on the cost model, service providers need to submit their tariff proposals to BRTI for regulatory approval which are then notified by the Director General of Post and Telecommunications (DJPT). The dominant provider, PT Telkom's approved tariffs are available on DJPTs website. Table

Table 17: PT Telkom revenue (Billion Rupiah)

	2002	2003	2004	2005	2006
Network Revenue	316	518	654	587	719
Total Revenue	20803	27116	33948	41807	51294
Network Revenue as a % of Total Revenue	1.52%	1.91%	1.93%	1.40%	1.40%

[18] *Minister's Regulation of No. 3/PERM.KOMINFO/1/2007 about Network Rent*

18 compares the new reduced E1 tariff with the old higher tariffs for E1s while Table 19 compares the new E1 tariffs with the prevailing tariffs in India, Singapore and Thailand. Several features of the new tariff are noteworthy. One, the decline ranges between 69 to 83 per cent for E1s and compares favorably with the percentage reduction introduced by TRAI for India in 1999. The extent of the decline itself speaks of the high prices that were being charged for leased circuits. Two, the implementation of the reduction had been delayed considerably and has cost the Indonesian economy in terms of lost opportunity. Since the tariff reduction has been implemented in April 2008, it will be several months before their impact is felt on internet tariffs and enterprises that use such circuits. Estimate of the cost is however attempted by benchmarking with India (see below). And finally, as table 19 and Chart 3 show the tariff for the circuits is still higher than the price of comparable circuits in India (except for distance > 500 kms), although it is less than prices prevailing in Thailand, Singapore and Australia[19].

Table 18: PT Telkoms old and new Tariff for E1 Compared (in US dollar)

Distance	Existing Tariff for PT Telkom Based On KM 12/97	PT Telkom Tariff for Java Based on PM 3/2007)	% Change
5			-
10	-	265	
15	1,416	265	-81
20	1,416	265	-81
25	1,416	745	-47
30	4,495	745	-83
35	4,495	745	-83
40	4,495	745	-83
45	4,495	745	-83
50	4,495	745	-83
100	4,495	745	-83
150	4,837	924	-81
200	4,837	924	-81
250	5,222	1,102	-79
300	5,222	1,102	-79
350	5,222	1,637	-69
400	5,222	1,637	-69
450	5,222	1,637	-69
500	5,222	1,637	-69

[19] *See Annex 1 for a chronology of the major events leading to the price decline and the corresponding references. Interestingly, while the trigger for the decline of* ***leased circuit*** *prices was the 2005 LIRNEasia study demonstrating the unreasonably high prices in Indonesia, the actual decline in leased circuit tariff occurred only in 2008. In the interim periodic ministerial announcements of the impending rationalization of leased circuit pricing appeared in the media and some tariff reductions occurred for internet access. Such announcements typically quoted the LIRNEasia study as well as appealed to the economic benefits of the tariff drop. In fact as recently as 9th July 2008, the internet service provider association, APJII announced that the decline in the Internet tariff 'still was difficult to be realized.'(see www.apjii.or.id).*

>500	5,222	1,637	-69

Source: DJPT website

The appraisal of the Indonesian prices with the corresponding Indian prices needs to be done carefully before drawing conclusions from such a comparison. Data available from PT Telkom's site for leased circuits shows that prices have been reduced for all categories of circuits (See Annex III). However a careful reading brings out several features of the Indonesian market that are important for rendering policy advice. First, the prices shown in Table 18 taken from DJPTs website are prices applicable for Java Island only. Tariffs for other Islands and between islands are different, in fact significantly higher. For example, a circuit in Sumatra costs 30 per cent more than the same circuit in Java (See Table 20). Likewise other island prices are higher than the prevailing prices in Sumatra. Second, inter island prices are substantially higher than intra island prices, the premium for inter island ranges from 22-30 per cent. As opposed to this, ceiling prices set by TRAI for India are the same across the country and while the delivered prices could differ the ceiling cannot be breached. And finally, more than 60 per cent of the circuits owned by PT Telkom are in Java, the pricing of the circuits further reinforcing the divide between Java and the other islands[20].

Table 19: Tariff for E1 across jurisdictions US dollar per kilometer

Distance	Indonesia (PT Telkom)	India (BSNL)	Thailand (Comm. Authority)	Singapore (Singtel)	Australia (Telstra)
5	265	36	1,503	2,821	1,982
10	265	53	1,503	2,821	2,348
15	265	70	1,503	2,821	2,714
20	265	87	1,503	2,821	2,952
25	745	105	1,503	2,821	3,190
30	745	122	1,503	2,821	3,428
35	745	139	1,503	2,821	3,666
40	745	156	1,503	2,821	3,904
45	745	173	1,503	2,821	4,143
50	745	195	1,503	2,821	4,381
100	745	372	1,503	2,821	5,229
150	924	548	1,503	2,821	5,229
200	924	725	2,515	2,821	6,414
250	1,102	901	2,515	2,821	8,081
300	1,102	1,078	2,515	2,821	8,081
350	1,637	1,254	3,803	2,821	8,081
400	1,637	1,431	3,803	2,821	9,555
450	1,637	1,608	3,803	2,821	9,555
500	1,637	1,784	3,803	2,821	11,417
>500	1,637	1,790	3,803	2,821	11,417

[20] *Discussions with the incumbent, PT Telkom and PSN Networks, a satellite operator in Indonesia revealed that infrastructure roll out has been concentrated in affluent islands such as Java. Moreover, network providers sell only excess capacity in the market after having met their own needs. And given Indonesia's unique topography, satellite provision remains a realistic though expensive option.*

Date	7-Apr-08	1-Nov-07	1-Oct-99	1-Nov-06	1-Nov-07
Source	Telkom	Teligen	Teligen	Teligen	Teligen

Source: As reported by DJPT accessed from www.dgpostel.id

Thus, while prices of leased circuits in Indonesia have fallen, these are still higher when compared with Indian prices. Table 21 shows the lower bound of this ratio to vary between 1.36 and 1.87 when estimated using prices within Java. This is a lower bound because of two reasons. One, as stated earlier, prices for islands other than Java are higher and two because Indian prices have fallen by an estimated 25-30[21] per cent below the ceiling specified by TRAI in 2005 due to competition. Therefore a more accurate estimate of the ratio of prevailing prices in Indonesia compared with India would be in the range 2.5 -3.5

Table 20: Comparison of Tariff in Java and Sumatra

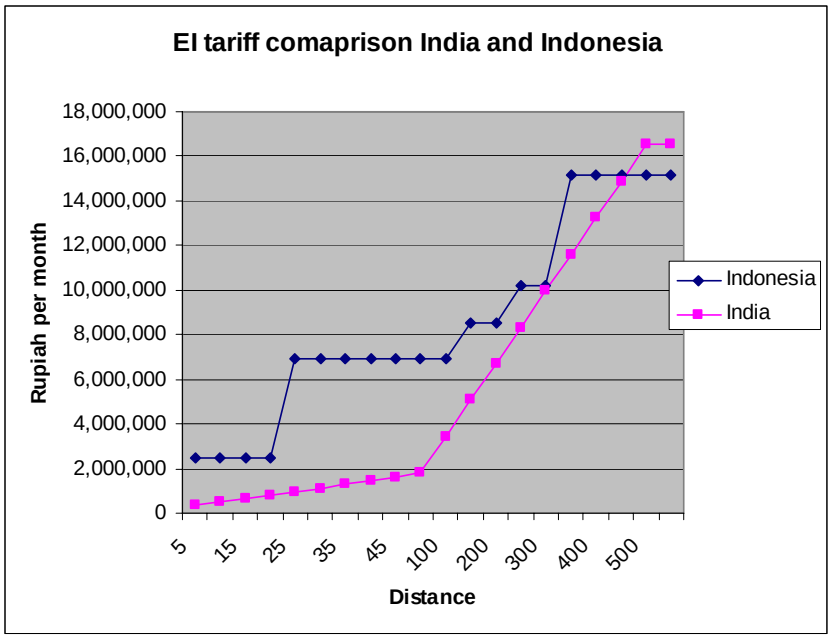
Distance in Kms	Intra Island Java US dollars per month	Intra Island Sumatra US dollars per month	Difference (Sumatra Premium)
Local	189	265	29%
25 -100	605	870	30%
100-200	783	1124	30%
200-300	961	1383	30%
300-600	1496	2150	30%
600-1000	2209	3171	30%
1000-3000	5774	8292	30%

Source: PT Telkom website and author calculation

DJPTs website provides an explanation of why Indonesian prices are still higher. This is due to the fact that "*India used the WACC level (Weighted Average Cost of Capital) that was more low and constructed his network by using the cable of optic fibre in the land and not submarine Fiber Optic Cable making the investment cost lower"* (www.dgpostel.id).

Chart 6

[21] Based on interviews with service providers and TRAI officials



Source: www.dgpostel.id

Table 21: Comparison of Leased circuits tariffs in US $ per month for > 500 km distance

	Indonesia (PT Telkom) Java	**India (BSNL)**	Ratio
E1	2247.25	1727.64	1.30
DS3	23192.31	12518.29	1.85
STM1	62923.08	33577.24	1.87

Admittedly the geography of Indonesia is difficult for deploying terrestrial and submarine fiber optic cable networks. Indonesia is the world's largest archipelagic state with more than 17,000 islands that stretch from the Indian Ocean to the Pacific Ocean spanning 5,150 kilometers. Among the major inhabited islands are Java, where 60% of Indonesians live, Sumatra, Kalimantan, Sulawesi and Papua. Out of a total area of 9.8 million square kilometers, 81 per cent is sea. Accordingly these unique features imply that satellite based leased circuits will always be in demand. In meetings with BRTI and a satellite based service provider it became apparent that satellites are deployed as a substitute for terrestrial or submarine cables; once the latter become available at a given location, satellites are shifted to an unserved or underserved areas where there is demand. In this way, satellite continues to remain relevant even at the high price it commands. The price for satellite based leased circuits remain prohibitively high and can cost anywhere between 6000-9000 US dollars per month for 2 Mbps. CSM, a satellite based provider charges 86 million rupiah per month for one E1 (Tariff reported to BRTI), slightly above 9000 US dollars at the current exchange rate. Given the importance of satellite based provision in Indonesia and the time required to deploy fibre optics, it might be worthwhile for BRTI to consider a cost based pricing scheme for satellite based provision. If it costs 4-5 times as much for satellite provision, so be it. But

if prices do not reflect the underlying cost and are high, temporary regulatory intervention in this realm, though a rarity, may be a solution to the problem[22].

Another area of concern that emerged during meetings with stakeholders is the dominance of PT Telkom in the last mile. There are 30 odd network licensees who can potentially provide leased circuits in Indonesia. According to BRTI, therefore, backbone infrastructure is unlikely to be a problem; it is the last mile dominance of PT Telkom that needs to be addressed. History of telecom liberalization across the world has demonstrated the difficulty of making incumbents offer fair terms to potential rivals, unless forced by tough regulatory measures. Evidence from Ofcom and Britain may provide a pointer for the next step necessary in Indonesia in this regard [See Box 2]. There is agreement across the industry that "infrastructure-based competition"—in other words, more network providers is the way forward. Indonesia has that part in place. BRTI should now get PT Telkom to adopt "local loop unbundling" (LLU) to open up the last mile at fair and reasonable terms. Rival ISP operators can thereby install or lease equipment for backbone and lease PT Telkom's lines for the "last mile" to the subscriber at cost based rates to be determined by the regulator.[23] Experience across the world however shows conditions for successfully introducing LLU are exacting and are unlikely to be met in Indonesia.

Box 2 : Why BT has suddenly decided to cut its wholesale prices

Has OFCOM, Britain's new communications regulator, won its first victory over BT, by scaring it into making huge price cuts? It certainly looks that way. On May 17th, BT announced dramatic reductions—of up to 70%—in the prices it charges rival operators that offer high-speed (broadband) internet links over its network. The announcement came days after OFCOM unveiled the first of several reports into the state of Britain's telecoms market, in which it criticised BT's high wholesale prices and alluded to the possibility of breaking the company up. Is that what prompted BT to cut its prices?

[22] *In markets where satellite competes with fiber/microwave, regulation of land-based backhaul will indirectly regulate satellite. It is only where satellite is the only option that regulation would be needed*.

[23] *Unbundling has been made to work in a number of countries with relatively dense and well developed traditional copper networks. However, the conditions have been exacting, requiring: customisation for the national market, alternative operators to enter the market medium‐term legal certainty for those operator, the incumbent operator to be sufficiently restrained, a powerful regulator to monitor progress and publish statistics, a rapid appeals process to avoid lengthy delays ,and a continuing refinement of the regulations. The greatest risk has been in the nightmare of regulatory gamesmanship played by certain incumbent operators. See Unbundling local loops: global experiences Ewan Sutherland, Link Centre 2007 accessed from http://link.wits.ac.za/papers/LINK.pdf*

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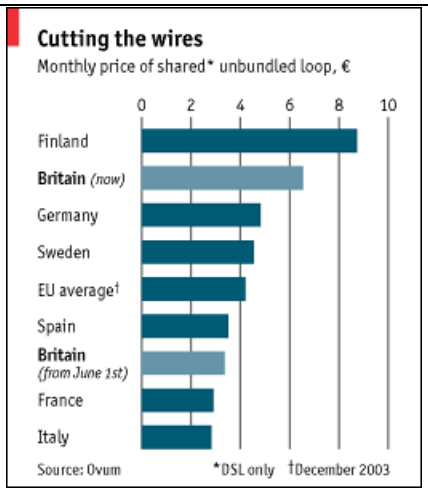


Certainly not, sniffs BT. While its actions might appear to have been prompted by fear of break-up, it says it was responding not to OFCOM's stick, but to its carrot. At the moment, BT shares its network with rival broadband providers in three ways. First, it offers them its own broadband services on a wholesale basis, for resale under their own brands. BT makes a good margin, and the rival operator does not have to build anything. Of the 2m or so broadband connections delivered over telephone lines in Britain, BT retails around half of them itself, and acts as a wholesaler for the rest in this way. Second, under a scheme called "local loop unbundling" (LLU), the rival operator can install its own equipment in local exchanges and lease BT's lines for the "last mile" from the exchange to the subscriber. This involves a lot more investment—rival operators need their own high-speed "backbones" to link up the exchanges—but allows them to differentiate themselves from BT. Uptake of LLU has, however, been slow: fewer than 10,000 lines have been unbundled. Last week, BT said it would reduce the prices of unbundled loops by around 35% from June 1st, with further cuts to come. But while the monthly cost per unbundled loop has fallen, the set-up charge for each one is still 50% above the European average, says Serafino Abate of Ovum, a consultancy. So there is room for more cuts. And while revenue per loop will fall, BT should benefit as the overall market grows. BT's aim is to encourage rival operators to pursue LLU and not its third broadband service, called DataStream. This is a halfway house between the first two options, forced on BT by regulators, in which rival operators use BT's backbone as well as their own infrastructure, providing some scope for differentiation. BT says this is unfair, since it allows its rivals to piggyback on the whizzy new backbone it is now building. It would much rather its rivals simply resold its broadband products, or built their own backbones and used LLU. With its new LLU prices, says Andrew Darley of ING, an investment bank, BT has now made LLU cheaper than DataStream. It has done so because Ofcom has said that if LLU takes off, it might relax the regulatory requirements around DataStream. It is this carrot, rather than the stick of break-up, that has prompted BT to act. What is striking is that there is suddenly agreement across the industry that "infrastructure-based competition"—in other words, more LLU—is the way forward. BT has historically been reluctant to push LLU, but has now decided that doing so is in its best interests. Conveniently, many of the rival firms that hoped to exploit LLU have gone bust (thanks, in part, to BT's previous delaying tactics).

May 20th 2004 The *Economist*

VI. Impact on Internet

The primary reason for intervention in the leased circuit market by the Indonesian government was to promote usage of internet. The rate of growth of internet subscribers has in fact declined in 2007-08 to 11 per cent (See Table 2 above). It is possible that the effect of the decline in leased line prices will be pass-through to internet tariff later and

only thereafter affect the subscriber base. An announcement by the Internet Association on its website states that ISPs in Indonesia are likely to reduce tariffs from 20 – 40% beginning June 2008, following reduction in leased line prices announced by the incumbent PT Telkom by 46 to 81 per cent in April 2008.[24] Other network providers are likely to follow suit, given that new entrants who provide backbone services will keep leased line prices aligned with PT Telkom due to pressure from the ministry[25]. The decline in tariff for leased circuits is based on the Decision of the Director General of post and telecommunications No.115/2008 (DJPT). According to the Chairman of APJII Sylvia W. Sumarlin, ISPs will reduce the internet tariff when most contracts with network providers are renewed in June 2008. The association confirmed the decline would be "fully implemented by next year in view of the fact that all contracts of the member's business with the provider of the network will be finished this year"[26]. While tariffs for the internet will fall, these will still remain substantially higher than the Indian prices. Even if one assumes that tariffs will decline by up to 40 % to about US $ 50 per month, these will still remain about double the Indian price (See Table 22).

Table 22: Comparison of Internet Tariff, April 2008

	ADSL Unlimited Usage
Indonesia	USD 83
India	USD 25
Ratio of Indonesian to Indian price	3.3:1

Source: Author, based on data provided by BSNL and PT Telkom

The reason for this is that the decline in network rent for ISPs does not include the international component; the 46 to 81 per cent decline in domestic leased line tariff covers about 40 per cent of the total production cost for ISPs. The policy implication of this is that IPLC tariffs also need to be reduced to make a further impact on Internet prices. BRTI therefore should consider bringing IPLC tariffs under the ambit of regulation, similar to what TRAI did in the case of India.

This paper has documented the enormous impact price reduction of leased circuits have had in India on other business users. Since leased lines are a critical producer good for ISPs, high leased line prices naturally result in high retail price for Internet services. They also jack up the cost for businesses using leased circuits adversely affecting their competitiveness. The high prices of leased circuits have also prevented the economy from realizing the multiplier effects of communications technology.

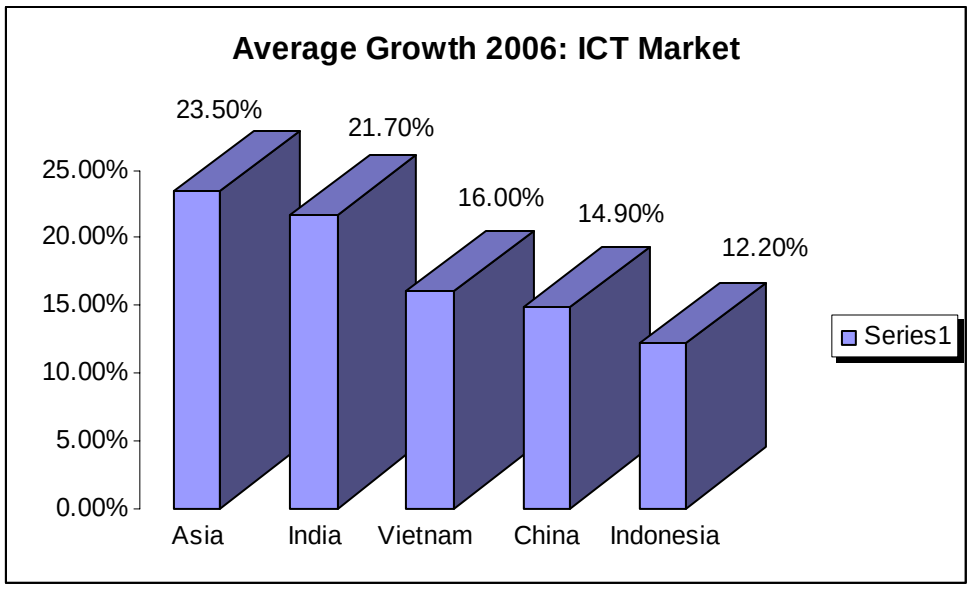
In addition to the benefits to the economy, lower leased circuit process could also have a substantial impact on the service provider bottom line due to elasticity effects. As stated above, PT Telkom's share of network revenue in total revenue is roughly 1.4 %. If one includes infrastructure and support provided for enterprise solutions, the share jumps to

[24] www.apjii.or.id
[25] Goswami 2006
[26] *Ibid*

30%[27]. Assuming a conservative elasticity of 2 for leased circuits, the unrealized benefits to PT Telkom from a 40 per cent reduction in leased line tariffs are estimated to be in the range of 60 billion to 1.2 trillion rupiah[28]. To realize these benefits PT Telkom has to eschew thinking of other telecom providers purchasing circuits from them as competitors, but as customers[29]. British Telecom's largest source of revenue today is from wholesale rather than retail customers[30]. If the output multiplier for communications for Indonesia is the same as that for India (3.1), the unrealized potential for the Indonesian economy ranges between 0.27% -5.25% of entire telecommunications sector revenue in 2007.

Like in India, the ICT market in Indonesia is also expected to bring opportunities for local and foreign vendors, as the country strives to embrace and deploy technologies in the hope to compete with countries in the ASEAN region. IDC forecasts that the IT market in Indonesia will reach US$1.9 billion in 2007 with annual growth rate of 10% in 2007. IT is one of Indonesia's fastest growing markets with an annual growth of 12.2% on average (Chart 7). It however accounts for less than half per cent of GDP today as opposed to India, where it accounts for 5.2%. The increasing needs for computerization in both private and public sectors make Indonesia a market with huge potential for software development, outsourcing and security services, essential for economic growth and national security.

Chart 7: Average Growth ICT Market



Source: Ministry of Industry

The main challenges facing Indonesian ICT industry include low internet penetration that stems from high leased-line prices. It is therefore crucial that appropriate regulatory

[27] Interview with PT Telkom

[28] This is a conservative assumption for elasticity. Economic theory tells us that elasticity tends to be higher at higher prices. Given the high prevailing leased circuit prices, the quantity response is therefore more than likely to offset the price reduction.

[29] This impression was given to the author in an interview.

[30] http://www.btplc.com/Sharesandperformance/Quarterlyresults/Quarterlyresults.htm

mechanisms are put in place for the economy to realize these benefits. It is not that the government has not recognised the benefits of telecom infrastructure; in fact the envisaged Palapa Ring Project aims to build a 36,000 kilometer fiber optic network connecting some 400 major spots in the country. It is expected to create a wireless network for telephone and broadband Internet. But it will be long before the Palapa Ring project materializes, in the interim the Indonesian government needs to be serious about implementing good policy to ensure that benefits of the telecom revolution do not bypass the Indonesian economy. The delay in lowering leased circuit prices in Indonesia has cost the economy in terms of revenue and efficiency. However, lowering leased line prices, albeit still high solving one part of the jigsaw puzzle i.e. lowering domestic leased circuit prices is clearly not enough. In the recommendations in the next section, it is argued that several other things need to be done for Indonesia to truly benefit from an efficient telecommunications sector.

VII Conclusions and Recommendations

Benefits of the telecommunications sector are no longer thought to be confined to the sector itself. The role of telecommunications as essential to the facilitation of international trade, economic development, and the enrichment of citizens' lives has become widely accepted. [31] Many emerging economy governments have come to view inadequate telecommunications networks and services as an impediment to achieving their full economic potential. Easy access to cheap, fast internet services has become a facilitator of economic growth and a measure of economic performance. Statistics show a surge in broadband use, especially in places that are already prosperous. The OECD, a rich-country club, had 221m subscribers in June 2007—a 24% leap over a year earlier. But it is not always the most powerful economies that are most wired. In Denmark, the Netherlands and Switzerland, over 30% of inhabitants have broadband. In America, by contrast, the proportion is 22%, only slightly above the OECD average of just under 20%. What accounts for the differences among rich countries? A few years ago demography was often cited: small, densely populated countries, such as Korea were easier to wire up than big, sparsely inhabited ones. But the leaders in broadband usage include Canada, where a tiny population is spread over a vast area. ***The best explanation, in fact, is that broadband thrives on a mix of competition and active regulation, to ensure an open contest***.[32]

It is not only broadband that thrives on a judicious mix of competition and regulatory intervention, other telecom services also vitally depend on it. A lack of competition-boosting oversight is one reason for the poor record of the United States in broadband. If one were to ask what is pulling Indonesia back in telecom sector in general and internet in particular, the two prime candidates would inevitably be inactive regulation and lack of competition. This has suited the incumbent service provider PT Telkom in that it neither raced to offer its customers faster access nor priced its leased lines competitively. India's BSNL was in a similar situation in 1999, when TRAI forced it to rationalize leased circuit prices. By itself the price reduction was not enough, it had to be complemented by alternative service, including infrastructure providers to boost supply and open the market to 'infrastructure based competition". Even then TRAI had to intervene a second time in 2005 to further align prices with cost for leased circuits.

[31] WTO, Background Note by the Secretariat, 1998
[32] Economist, Jan 17, 2008

Indonesia has reduced leased circuit prices by 46-81 per cent, but the recommendation of this paper is to complement this achievement by competition boosting regulation for full exploitation of benefits.

The author was informed that there are 30 network providers in Indonesia, but effective competition is yet to emerge in this segment. By any economic measure, PT Telkom is dominant, and its dominance is obstructive in the last mile. A structural remedy such as breaking up the incumbent is economically undesirable today and politically naïve. A workable option is to force PT Telkom to rent out its last mile or unbundle the local loop. In France, one small start-up firm rented out France Telkom's local loop and then installed technology that was much faster than any of its rivals. It won so many customers that other operators had to follow suit. In Canada, too, the regulator mandated line-sharing, and provinces subsidised trunk lines from which smaller operators could lease capacity to provide service.[33] In South Korea, where half the population lives in flats, each block owns its own internal cabling and allows rival operators to put their equipment in the basement; each tenant then chooses which to use. All these examples highlight the benefit of competition, a creature that has been absent in the Indonesian leased-line and Internet market.

The second policy recommendation is for BRTI to intervene in the IPLC market as well and specify the cost model. TRAI implemented this in India in 2005 and substantial benefits have accrued since to software exporters and IT firms, besides making internet more accessible and affordable. Since BRTI already has a cost based model for DLCs in place, it should be a short step to include IPLCs as part of regulatory oversight.

Given the nature of Indonesia's geography a third recommendation is to cap satellite prices as well. This might be politically more difficult due to vested interests and reluctance of service providers to disclose costs. The paper has argued that satellite based circuits will always be in demand; the current price seems to be based on extracting consumer surplus, rather than on leveraging externalities associated with such provision. In case the regulator (ministry) is reluctant to specify tariffs for satellite provision, morally persuading the operators to lower prices is an alternative.

It is not the intention of this paper to propose 'over regulation' of the sector. The dangers of that are well known and add to the regulatory risk in operations. Market failures however need to be addressed by independent and competent regulators. While BRTI has five carefully chosen members, it does not have the power to unilaterally pass decisions. Its budget is allocated by the ministry DGPT and it is only an advisor to DGPT. Although DGPT is required to consult BRTI on regulatory matters, it is not obliged to follow BRTI's recommendations. BRTI's decisions should be final but, in practice, they are revised by DGPT.[34] Therefore the final recommendation of this paper is to create a regulatory and institutional mechanism whereby the regulator, BRTI becomes a truly professional body, accountable for its decisions but independent of the ministry. It should be funded as per international best practice by a proportion of sector revenue and be able to take decisions in the interest of the sector rather than in the narrow interest of the incumbent operator. Unless that is done, the full benefits of telecom and technology would remain elusive for Indonesia and more importantly, Indonesians.

[33] Ibid
[34] Goswami 2006

Annex I

Chronology of events	Date	Remarks
LIRNE*asia* Study; Indonesia Wi-Fi Innovation by Divakar Goswami & Onno Purbo	2005	Indonesian leased line prices are up to 48 times more than Indian prices. Paper recommends lowering prices so as to promote internet development and push economic development
LIRNEasia Networking Meeting; Jakarta Hilton, Indonesia Director General Present	October 2, 2005	LIRNE*asia* researchers presented findings from the WiFi study Minister promises action; generated enormous press coverage. Press Coverage: • LIRNEasia's WiFi Study in Indonesia Influences Policy Process; Business News October 14, 2005 • Innovative approach promotes use of WiFi in Indonesia; Business News, November 14, 2005 • The Government Studies Method of Lowering Broadband Tariff; Achmad Rouzni Noor Ii – detikInet Jakarta, March 14, 2006
Usable Knowledge for Growing the Sector: ICT Policy & Regulation Research from LIRNEasia; The Park Hotel, New Delhi, India	March 6, 2006	Research results presented in India
Concluding remarks at Leased Lines Seminar at the 33rd APEC TEL meeting in Calgary, Canada	April 2006	Research results presented in Canada
Process of Reduction of Leased Line prices begins: Minister of Communication and information stipulation number: (03/PERM.KOMINFO/1/2007)	2007	Publishes methodology for revision in Leased Line Tariff
Model provided by BRTI	2007	Regarding network rent belonging to PT. TeleKom as the organizer
Notification of Tariff Decline by DJPT	April 2008	The press release No. 32/DJPT.1/KOMINFO/4/2008 regarding the decline in Network Rent towards the Decline in the tariff of Internet Access
Press Release No. 42/DJPT.1/KOMINFO/4/2008 Implementation of the Government	April 2008	Director General of Post Basuki Yusuf Iskandar on 17 April 2008 has a press conference related, inter alia to the implementation of the

Information About New Retail Tariff PSTN, Mobile, FWA, Rental Network for Internet access and tariff Campaign Issues		new tariff to access networks.

Annex II: Trends in Domestic Leased line tariffs (for highest distance slab)

(US dollars per annum, converted from rupees at prevailing exchange rates available at www.rbi.gov.in)

	Pre-TTO	Ceiling tariff as per TTO-99	Market price as of Dec-04	Revised Tariff (2005)
E1	**157,885**	**50,586**	**20,009**	**18,624**
DS3	**3,315,582**	**1,062,313**	**420,646**	**134,947**
STM1	**9,946,745**	**3,186,940**	**1,259,663**	**361,963**
64 Kbps	**33,043**	**2,207**	**2,183**	**964**

- **Tariffs for 64 kbps is for services through classical method**

Trends in Domestic Leased line tariffs (for distance of 50 Kms)

(US dollars per annum, converted from rupees at prevailing exchange rates available at www.rbi.gov.in)

	Pre-TTO	Ceiling tariff as per TTO-99	Market price as of Dec-04	Revised Tariff (2005)
E1	**35,253**	**8,025**	**3,161**	**2,038**
DS3	**740,306**	**168,338**	**66,576**	**15,535**
STM1	**2,220,917**	**505,036**	**199,773**	**41,652**
64 Kbps	**4,395**	**782**	**773**	**285**

Trends in Domestic Leased line tariffs (for distance of 100 Kms)

(US dollars per annum, converted from rupees at prevailing exchange rates available at www.rbi.gov.in)

	Pre-TTO	Ceiling tariff as per TTO-99	Market price as of Dec-04	Revised Tariff (2005)
E1	47,004	12,371	4,889	3,856
DS3	987,074	259,991	102,842	28,812
STM1	2,961,222	780,018	308,527	77,235
64 Kbps	5,288	943	932	351

Trends in Domestic Leased line tariffs (for distance of 200 Kms)

(US dollars per annum, converted from rupees at prevailing exchange rates available at www.rbi.gov.in)

	Pre-TTO	Ceiling tariff as per TTO-99	Market price as of Dec-04	Revised Tariff (2005)
E1	70,505	21,867	8,663	7,537
DS3	1,480,611	1,057,645	418,349	134,926
STM1	4,441,833	1,378,248	545,157	148,379
64 Kbps	8,085	1,242	1,228	504

Trends in Domestic Leased line tariffs (for distance of 500 Kms)

(US dollars per annum, converted from rupees at prevailing exchange rates available at www.rbi.gov.in)

	Pre-TTO	Ceiling tariff as per TTO-99	Market price as of Dec-04	Revised Tariff (2005)
E1	88,132	50,356	19,918	18,558

DS3	**1,326,392**	**1,057,645**	**418,349**	**134,926**
STM1	**3,979,154**	**3,172,982**	**1,255,048**	**361,854**
64 Kbps	**13,208**	**2,207**	**2,183**	**942**

Trends in IPLC (Half Circuit) Lease rentals

(US dollars per annum, converted from rupees at prevailing exchange rates available at www.rbi.gov.in)

Capacity	Year wise tariff for IPLC (Per annum)					
	2002*	2003#	1.1.04 #	1.4.04#	2005#	Revised Tariff (2005)
E1 (2Mbps)	54,009	67,559	53,888	48,431	44,259	28,484
DS3 (45Mbps)	978,396	1,033,121	1,011,824	911,778	790,973	227,870
STM1 (155Mbps)	2,835,480	2,994,078	2,808,095	2,528,422	2,191,060	655,127

*** Tariff for IPLC services irrespective of the destination**

 # Tariff applicable for restorable Category and for the farthest destination from India

Annex III

PT Telkom Leased Circuit Tariff by Island and Distance in Indonesian Rupiah

Speed : 2 Mbps

Tarif Sewa Jaringan Node to Node Antar Pulau — Speed 2 Mbps

Dari \ Ke	Jarak backbone antar kota antar Pulau	Sumatra	Jawa	Kalimantan	Sulawesi	BaliNusra
Sumatra	Lokal	2.450.000	-	-	-	-
	>25 - 100 Km	8.050.000	6.800.000	8.250.000	8.300.000	8.500.000
	>100 - 200 Km	10.400.000	8.850.000	10.650.000	10.750.000	11.050.000
	>200 - 300 Km	12.800.000	10.850.000	13.100.000	13.200.000	13.550.000
	>300 - 600 Km	19.900.000	16.850.000	20.400.000	20.600.000	21.100.000
	>600 - 1000 Km	29.350.000	24.900.000	30.100.000	30.400.000	31.100.000
	>1000 - 3000 Km	76.750.000	65.100.000	78.700.000	79.400.000	81.350.000
	>3000 Km	124.100.000	105.300.000	127.300.000	128.450.000	131.600.000
Jawa	Lokal Jabodetabek	-	1.750.000	-	-	-
	Lokal Lainnya	-	2.250.000	-	-	-
	>25 - 100 Km	6.800.000	5.600.000	7.000.000	7.100.000	7.300.000
	>100 - 200 Km	8.850.000	7.250.000	9.100.000	9.200.000	9.450.000
	>200 - 300 Km	10.850.000	8.900.000	11.150.000	11.300.000	11.600.000
	>300 - 600 Km	16.850.000	13.850.000	17.400.000	17.550.000	18.050.000
	>600 - 1000 Km	24.900.000	20.450.000	25.650.000	25.950.000	26.650.000
	>1000 - 3000 Km	65.100.000	53.450.000	67.050.000	67.800.000	69.700.000
	>3000 Km	105.300.000	127.300.000	128.450.000	131.600.000	112.750.000
Kalimantan	Lokal	-	-	2.550.000	-	-
	>25 - 100 Km	8.250.000	7.000.000	8.450.000	8.500.000	8.750.000
	>100 - 200 Km	10.650.000	9.100.000	10.950.000	11.050.000	11.300.000
	>200 - 300 Km	13.100.000	11.150.000	13.450.000	13.550.000	13.850.000
	>300 - 600 Km	20.400.000	17.400.000	20.900.000	21.100.000	21.600.000
	>600 - 1000 Km	30.100.000	25.650.000	30.850.000	31.150.000	31.900.000
	>1000 - 3000 Km	78.700.000	67.050.000	80.650.000	81.400.000	83.300.000
	>3000 Km	127.300.000	108.450.000	130.500.000	131.650.000	134.750.000
Sulawesi	Lokal	-	-	-	2.850.000	-
	>25 - 100 Km	8.300.000	7.100.000	8.500.000	8.600.000	8.800.000
	>100 - 200 Km	10.750.000	9.200.000	11.050.000	11.150.000	11.400.000
	>200 - 300 Km	13.200.000	11.300.000	13.550.000	13.650.000	14.000.000
	>300 - 600 Km	20.600.000	17.550.000	21.100.000	21.250.000	21.750.000
	>600 - 1000 Km	30.400.000	25.950.000	31.150.000	31.400.000	32.150.000
	>1000 - 3000 Km	79.400.000	67.800.000	81.400.000	82.100.000	84.050.000
	>3000 Km	128.450.000	109.650.000	131.650.000	132.800.000	135.900.000
BaliNusra	Lokal	-	-	-	-	3.150.000
	>25 - 100 Km	8.500.000	7.300.000	8.750.000	8.800.000	9.000.000
	>100 - 200 Km	11.050.000	9.450.000	11.300.000	11.400.000	11.650.000
	>200 - 300 Km	13.550.000	11.600.000	13.850.000	14.000.000	14.300.000
	>300 - 600 Km	21.100.000	18.050.000	21.600.000	21.750.000	22.250.000
	>600 - 1000 Km	31.100.000	26.650.000	31.900.000	32.150.000	32.900.000
	>1000 - 3000 Km	81.350.000	69.700.000	83.300.000	84.050.000	85.950.000
	>3000 Km	131.600.000	112.750.000	134.750.000	135.900.000	139.050.000

Speed : 8 Mbps

Tarif Sewa Jaringan Node to Node Antar Pulau — Speed 8 Mbps

Dari \ Ke	Jarak backbone antar kota antar Pulau	Sumatra	Jawa	Kalimantan	Sulawesi	BaliNusra
Sumatra	Lokal	7.350.000	-	-	-	-
	>25 - 100 Km	24.100.000	20.450.000	24.750.000	24.950.000	25.550.000
	>100 - 200 Km	31.200.000	26.500.000	32.000.000	32.300.000	33.100.000
	>200 - 300 Km	38.350.000	32.500.000	39.300.000	39.650.000	40.650.000
	>300 - 600 Km	59.650.000	50.600.000	61.200.000	61.750.000	63.250.000
	>600 - 1000 Km	88.100.000	74.700.000	90.350.000	91.150.000	93.350.000
	>1000 - 3000 Km	230.250.000	195.300.000	236.100.000	238.250.000	244.050.000
	>3000 Km	372.350.000	315.900.000	381.900.000	385.400.000	394.750.000
Jawa	Lokal Jabodetabek	-	5.200.000	-	-	-
	Lokal Lainnya	-	6.800.000	-	-	-
	>25 - 100 Km	20.450.000	16.800.000	21.050.000	21.300.000	21.900.000
	>100 - 200 Km	26.500.000	21.750.000	27.300.000	27.550.000	28.350.000
	>200 - 300 Km	32.500.000	26.700.000	33.500.000	33.850.000	34.800.000
	>300 - 600 Km	50.600.000	41.550.000	52.150.000	52.700.000	54.200.000
	>600 - 1000 Km	74.700.000	61.350.000	76.950.000	77.800.000	80.000.000
	>1000 - 3000 Km	195.300.000	160.350.000	201.200.000	203.350.000	209.150.000
	>3000 Km	315.900.000	259.400.000	325.400.000	328.900.000	338.250.000
Kalimantan	Lokal	-	-	7.600.000	-	-
	>25 - 100 Km	24.750.000	21.050.000	25.350.000	25.550.000	26.200.000
	>100 - 200 Km	32.000.000	27.300.000	32.800.000	33.100.000	33.900.000
	>200 - 300 Km	39.300.000	33.500.000	40.300.000	40.650.000	41.600.000
	>300 - 600 Km	61.200.000	52.150.000	62.700.000	63.250.000	64.750.000
	>600 - 1000 Km	90.350.000	76.950.000	92.600.000	93.400.000	95.650.000
	>1000 - 3000 Km	236.100.000	201.200.000	242.000.000	244.150.000	249.950.000
	>3000 Km	381.900.000	325.400.000	391.450.000	394.950.000	404.300.000
Sulawesi	Lokal	-	-	-	8.500.000	-
	>25 - 100 Km	24.950.000	21.300.000	25.550.000	25.800.000	26.400.000
	>100 - 200 Km	32.300.000	27.550.000	33.100.000	33.400.000	34.200.000
	>200 - 300 Km	39.650.000	33.850.000	40.650.000	41.000.000	41.950.000
	>300 - 600 Km	61.750.000	52.700.000	63.250.000	63.800.000	65.300.000
	>600 - 1000 Km	91.150.000	77.800.000	93.400.000	94.250.000	96.450.000
	>1000 - 3000 Km	238.250.000	203.350.000	244.150.000	246.300.000	252.100.000
	>3000 Km	385.400.000	328.900.000	394.950.000	398.400.000	407.750.000
BaliNusra	Lokal	-	-	-	-	9.500.000
	>25 - 100 Km	25.550.000	21.900.000	26.200.000	26.400.000	27.000.000
	>100 - 200 Km	33.100.000	28.350.000	33.900.000	34.200.000	34.950.000
	>200 - 300 Km	40.650.000	34.800.000	41.600.000	41.950.000	42.950.000
	>300 - 600 Km	63.250.000	54.200.000	64.750.000	65.300.000	66.800.000
	>600 - 1000 Km	93.350.000	80.000.000	95.650.000	96.450.000	98.650.000
	>1000 - 3000 Km	244.050.000	209.150.000	249.950.000	252.100.000	257.900.000
	>3000 Km	394.750.000	338.250.000	404.300.000	407.750.000	417.100.000

Speed : 45 Mbps

Tarif Sewa Jaringan Node to Node Antar Pulau — Speed 45 Mbps

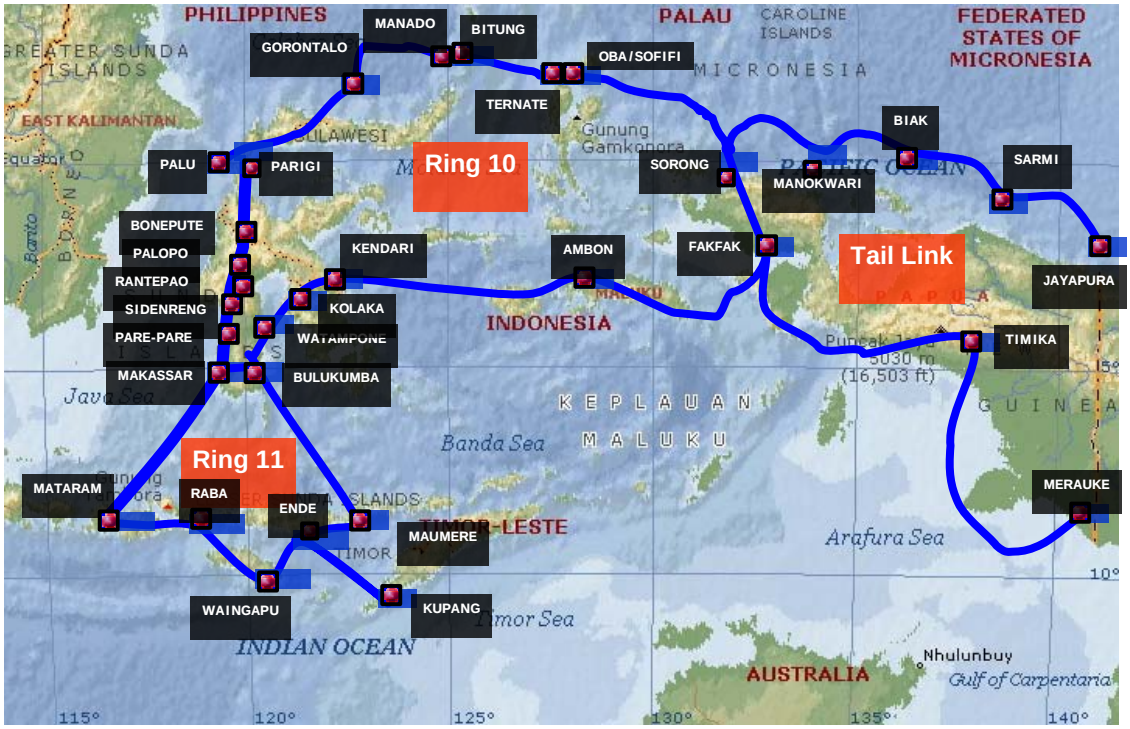
Dari \ Ke	Jarak backbone antar kota antar	Sumatra	Jawa	Kalimantan	Sulawesi	BaliNusra
Sumatra	Lokal	25.350.000	-	-	-	-
	>25 - 100 Km	82.950.000	70.350.000	85.050.000	85.850.000	87.950.000
	>100 - 200 Km	107.400.000	91.100.000	110.150.000	111.150.000	113.850.000
	>200 - 300 Km	131.850.000	111.850.000	135.200.000	136.450.000	139.750.000
	>300 - 600 Km	205.200.000	174.050.000	210.450.000	212.350.000	217.500.000
	>600 - 1000 Km	303.000.000	257.000.000	310.750.000	313.600.000	321.200.000
	>1000 - 3000 Km	792.000.000	671.800.000	812.250.000	819.650.000	839.550.000
	>3000 Km	1.280.950.000	1.086.600.000	1.313.750.000	1.325.750.000	1.357.950.000
Jawa	Lokal Jabodetabek	-	17.950.000	-	-	-
	Lokal Lainnya	-	23.350.000	-	-	-
	>25 - 100 Km	70.350.000	57.800.000	72.500.000	73.250.000	75.350.000
	>100 - 200 Km	91.100.000	74.800.000	93.850.000	94.850.000	97.550.000
	>200 - 300 Km	111.850.000	91.850.000	115.200.000	116.450.000	119.750.000
	>300 - 600 Km	174.050.000	142.950.000	179.300.000	181.250.000	186.400.000
	>600 - 1000 Km	257.000.000	211.050.000	264.800.000	267.600.000	275.200.000
	>1000 - 3000 Km	671.800.000	551.650.000	692.100.000	699.500.000	719.400.000
	>3000 Km	1.086.600.000	892.250.000	1.119.450.000	1.131.400.000	1.163.600.000
Kalimantan	Lokal	-	-	26.200.000	-	-
	>25 - 100 Km	85.050.000	72.500.000	87.200.000	87.950.000	90.050.000
	>100 - 200 Km	110.150.000	93.850.000	112.900.000	113.900.000	116.600.000
	>200 - 300 Km	135.200.000	115.200.000	138.600.000	139.850.000	143.150.000
	>300 - 600 Km	210.450.000	179.300.000	215.700.000	217.600.000	222.800.000
	>600 - 1000 Km	310.750.000	264.800.000	318.500.000	321.350.000	328.950.000
	>1000 - 3000 Km	812.250.000	692.100.000	832.550.000	839.950.000	859.850.000
	>3000 Km	1.313.750.000	1.119.450.000	1.346.600.000	1.358.550.000	1.390.750.000
Sulawesi	Lokal	-	-	-	29.150.000	-
	>25 - 100 Km	85.850.000	73.250.000	87.950.000	88.750.000	90.850.000
	>100 - 200 Km	111.150.000	94.850.000	113.900.000	114.900.000	117.600.000
	>200 - 300 Km	136.450.000	116.450.000	139.850.000	141.050.000	144.400.000
	>300 - 600 Km	212.350.000	181.250.000	217.600.000	219.550.000	224.700.000
	>600 - 1000 Km	313.600.000	267.600.000	321.350.000	324.200.000	331.800.000
	>1000 - 3000 Km	819.650.000	699.500.000	839.950.000	847.350.000	867.250.000
	>3000 Km	1.325.750.000	1.131.400.000	1.358.550.000	1.370.550.000	1.402.700.000
BaliNusra	Lokal	-	-	-	-	32.700.000
	>25 - 100 Km	87.950.000	75.350.000	90.050.000	90.850.000	92.900.000
	>100 - 200 Km	113.850.000	97.550.000	116.600.000	117.600.000	120.300.000
	>200 - 300 Km	139.750.000	119.750.000	143.150.000	144.400.000	147.700.000
	>300 - 600 Km	217.500.000	186.400.000	222.800.000	224.700.000	229.850.000
	>600 - 1000 Km	321.200.000	275.200.000	328.950.000	331.800.000	339.400.000
	>1000 - 3000 Km	839.550.000	719.400.000	859.850.000	867.250.000	887.150.000
	>3000 Km	1.357.950.000	1.163.600.000	1.390.750.000	1.402.700.000	1.434.900.000

Speed : 155 Mbps

Tarif Sewa Jaringan Node to Node Antar Pulau — Speed 155 Mbps

Dari \ Ke	Jarak backbone antar kota antar	Sumatra	Jawa	Kalimantan	Sulawesi	BaliNusra
Sumatra	Lokal	68.800.000	-	-	-	-
	>25 - 100 Km	225.050.000	190.900.000	230.800.000	232.900.000	238.550.000
	>100 - 200 Km	291.400.000	247.200.000	298.850.000	301.550.000	308.900.000
	>200 - 300 Km	357.700.000	303.450.000	366.900.000	370.250.000	379.200.000
	>300 - 600 Km	556.750.000	472.250.000	571.000.000	576.200.000	590.200.000
	>600 - 1000 Km	822.050.000	697.350.000	843.100.000	850.800.000	871.450.000
	>1000 - 3000 Km	2.148.800.000	1.822.750.000	2.203.800.000	2.223.900.000	2.277.900.000
	>3000 Km	3.475.500.000	2.948.200.000	3.564.500.000	3.597.000.000	3.684.300.000
Jawa	Lokal Jabodetabek	-	48.750.000	-	-	-
	Lokal Lainnya	-	63.400.000	-	-	-
	>25 - 100 Km	190.900.000	156.750.000	196.650.000	198.750.000	204.450.000
	>100 - 200 Km	247.200.000	202.950.000	254.650.000	257.350.000	264.700.000
	>200 - 300 Km	303.450.000	249.150.000	312.600.000	315.950.000	324.950.000
	>300 - 600 Km	472.250.000	387.800.000	486.500.000	491.700.000	505.700.000
	>600 - 1000 Km	697.350.000	572.600.000	718.400.000	726.100.000	746.750.000
	>1000 - 3000 Km	1.822.750.000	1.496.750.000	1.877.800.000	1.897.900.000	1.951.850.000
	>3000 Km	2.948.200.000	2.420.900.000	3.037.200.000	3.069.700.000	3.157.000.000
Kalimantan	Lokal	-	-	71.150.000	-	-
	>25 - 100 Km	230.800.000	196.650.000	236.600.000	238.700.000	244.350.000
	>100 - 200 Km	298.850.000	254.650.000	306.300.000	309.050.000	316.350.000
	>200 - 300 Km	366.900.000	312.600.000	376.050.000	379.400.000	388.350.000
	>300 - 600 Km	571.000.000	486.500.000	585.250.000	590.450.000	604.450.000
	>600 - 1000 Km	843.100.000	718.400.000	864.200.000	871.850.000	892.500.000
	>1000 - 3000 Km	2.203.800.000	1.877.800.000	2.258.850.000	2.278.950.000	2.332.900.000
	>3000 Km	3.564.500.000	3.037.200.000	3.653.500.000	3.686.000.000	3.773.300.000
Sulawesi	Lokal	-	-	-	79.100.000	-
	>25 - 100 Km	232.900.000	198.750.000	238.700.000	240.800.000	246.450.000
	>100 - 200 Km	301.550.000	257.350.000	309.050.000	311.750.000	319.100.000
	>200 - 300 Km	370.250.000	315.950.000	379.400.000	382.750.000	391.700.000
	>300 - 600 Km	576.200.000	491.700.000	590.450.000	595.650.000	609.650.000
	>600 - 1000 Km	850.800.000	726.100.000	871.850.000	879.550.000	900.200.000
	>1000 - 3000 Km	2.223.900.000	1.897.900.000	2.278.950.000	2.299.000.000	2.353.000.000
	>3000 Km	3.597.000.000	3.069.700.000	3.686.000.000	3.718.500.000	3.805.800.000
BaliNusra	Lokal	-	-	-	-	88.650.000
	>25 - 100 Km	238.550.000	204.450.000	244.350.000	246.450.000	252.100.000
	>100 - 200 Km	308.900.000	264.700.000	316.350.000	319.100.000	326.400.000
	>200 - 300 Km	379.200.000	324.950.000	388.350.000	391.700.000	400.700.000
	>300 - 600 Km	590.200.000	505.700.000	604.450.000	609.650.000	623.600.000
	>600 - 1000 Km	871.450.000	746.750.000	892.500.000	900.200.000	920.850.000
	>1000 - 3000 Km	2.277.900.000	1.951.850.000	2.332.900.000	2.353.000.000	2.407.000.000
	>3000 Km	3.684.300.000	3.157.000.000	3.773.300.000	3.805.800.000	3.893.100.000

Annex 3 : Palapa Ring Fiber-Optical Network



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