

INDONESIA: Connecting the Archipelago

1. Summary

Indonesia's telecommunications sector is becoming increasingly dynamic and diversified. This year has witnessed continued, dramatic growth in wireless and fixed-wireless telephony, the launch of third-generation (3G) wireless services, and increased diffusion of wireless Internet services. Yet the unmet demand for telecommunications, ranging from basic telephony at the village level to high-speed Internet access, remains very large, especially outside major urban areas and in Eastern Indonesia.

The government is pressing ahead with its reform agenda with the ultimate goal of increasing competition and mobilizing new investment in the sector. It has started to address key reforms in such areas as interconnection, licensing and spectrum management, and developing a new universal service policy and program. However, it is also facing increasingly complex policy and regulatory challenges linked to changing technologies—notably the convergence of voice, data and media—and their impact on market structures.

The investment needs for rural telecommunications infrastructure are substantial, the bulk to be resourced from private capital, and through public-private partnerships to leverage resources to provide access in areas that are commercially less attractive. The principal PPP opportunities for the medium-term are expected to be in: (a) high-speed communications “backbone” infrastructure that would permit the rollout of voice communications, Internet and broadcasting services on a very large scale and have far-reaching economic and social impacts; and (b) access networks or “last mile” particularly to reach unserved or under-served consumers in rural areas.

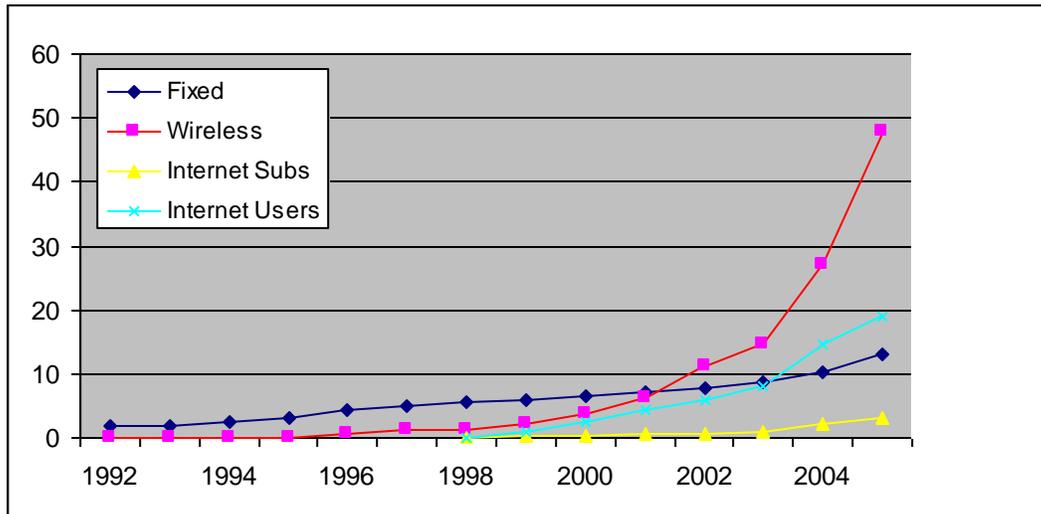
2. Telecommunications Infrastructure: Achievements, Challenges.

Indonesia's telecommunications market is expanding and diversifying in line with global trends. Annex 1 provides a snapshot of the current market structure, major operators and subscriber numbers. Key developments in 2005-6 were as follows:

- **Strong growth in wireless (mobile) telephony.** Access to telecommunications increased significantly, largely due to the high growth in wireless and fixed-wireless¹ services. The trends of 2001-4, illustrated in Figure 1, continued through 2005-6. There were about 48 million GSM wireless subscribers at the end of 2005, and the number surged past the 50 million mark in mid-2006. This growth is attributable to the increased rollout of networks, availability of pre-paid services (over 95 percent of subscriptions) and falling costs of handsets. The major operators have invested about US\$4.2 billion in wireless networks in 2001-5, and expect to invest similar amounts in 2005-2006. Fixed-wireless (CDMA) also grew about 33 percent, year on year, in 2005 reaching 4.5 million subscribers.

¹ The main mobile technology used in Indonesia is GSM (Global System for Mobile Communications). Fixed-wireless uses CDMA (code division multiple access), e.g. CDMA 2000 and CDMA 450 depending on frequency, and offers limited mobility, typically within a single area code, at prices on par with fixed-line services.

**Figure 1. Growth of Fixed, Wireless and Internet
(Millions of Users)**



Sources: *International Telecommunications Union, DG-Postel, BRTI (Regulator)*

- **Relatively slow growth of fixed-line services**, particularly given fixed-wireless substitution. Costs of around US\$700-800 per fixed line, compared to US\$200-300 for fixed wireless, has prompted operators to divert resources to fixed-wireless. Fixed lines (about 9 million) are limited largely to urban areas of Jakarta, Surabaya, Semanang, Bandung, Medan and Denpasar, and are not expected to grow significantly. The ratio of wireless: fixed is about 5:1 and growing. Alternative fixed networks (such as powerline) are under consideration.
- **Increased use of basic wireless data services**, e.g. text messaging (SMS), and some use of mobile applications such as mobile payments/funds transfer. The introduction of 3G may precipitate more extensive use of mobile data services, albeit limited to a small market in the short run, given the limited network coverage and high cost of handsets. The five 3G license-holders are required to roll out service in two provinces in the first year of operation, and in six provinces within 10 years. The first service was launched in Jakarta in September 2006.
- **Relatively limited growth of Voice over IP**, for several reasons. VoIP offers significant domestic and international long-distance market where Telkom and Indosat maintain a duopoly. The three major telecom operators, four other licensed VoIP providers and several unlicensed providers are offering VoIP. However, there has been some resistance in the industry to further competition through VoIP; the government has intervened to limit the number of operators and restrict the level of call discounting. Interconnection with fixed operators has also been problematic. Moreover, there are major impediments to increased Internet access, discussed below.

Indonesia's teledensity, or percentage of inhabitants with access to telecommunications, **lags behind that of its regional neighbours** (see Table 1). Teledensity as of end-2005 is estimated at: fixed: 5.7 percent, up from 4.8 percent at end-2004; and mobile: 22 percent, up from 13.5 percent at end-2004.

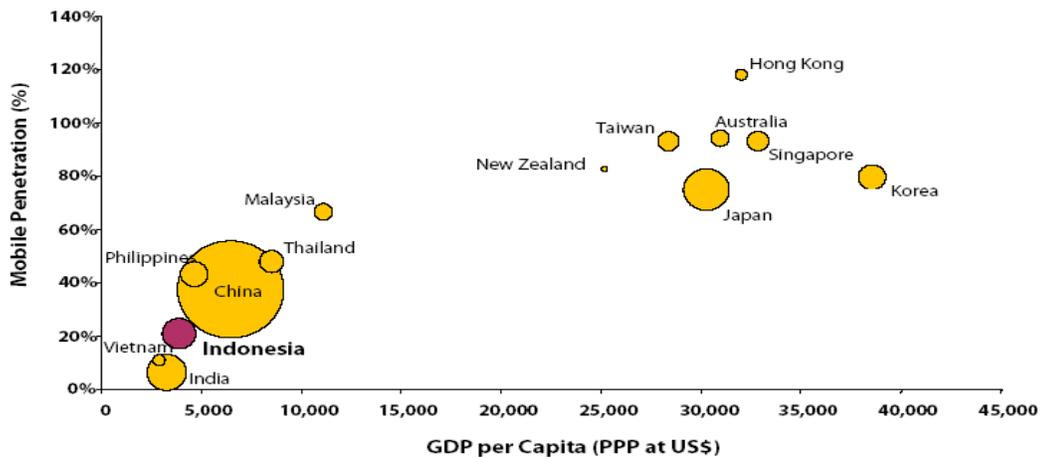
Table 1. Comparative Teledensity, 2005*

| | Malaysia | Thailand | Philippines | China | Indonesia | Vietnam | India |
|------------|----------|----------|-------------|-------|-----------|---------|-------|
| Fixed % | 16.79 | 10.95 | <i>4.16</i> | 26.63 | 5.73 | 18.81 | 4.51 |
| Mobile % | 75.17 | 42.98 | 39.50 | 29.90 | 21.06 | 11.39 | 8.16 |
| Internet % | 42.37 | 11.03 | 5.32 | 8.44 | 7.18 | 12.72 | 5.44 |

Source: International Telecommunication Union. Note: Data in italics are from a previous year
 *Percentage of inhabitants with access to telecommunications,

Moreover, while telecoms infrastructure coverage has increased, access remains uneven. As many as 85 percent of Indonesia’s population is technically under the “footprint” of the mobile signal. The country’s largest mobile operator is now targeting 100% network coverage for *kecamatan*s in Java, Sumatra and Kalimantan. However, in many rural areas, particularly in Eastern Indonesia (Sulawesi, Maluku, Nusa Tenggara, Papua), communities are unable to access these networks. Two thirds of villages lack a public phone. As with other infrastructure, rates vary considerably by region, with public phone access only available in 19 percent of Southeast Sulawesi’s villages, for example.

Figure 2. Comparative Mobile Penetration Rates, East Asia & South Asia



Note: Bubble size indicates number of subscribers.

Source: Pyramid Research (2005)

Internet access has lagged, due mainly to regulatory and bandwidth constraints despite the increased competition among Internet Service Providers in terms of price, quality of service and network coverage and growth in the WiFi (short-range broadband wireless access) segment. Estimates of subscriber/user numbers vary but suggest that overall Internet penetration was around 9 percent at the end of 2005² which is among the lowest in East Asia. Internet access

² Early-2005 data estimated 20 million Internet subscribers, and 150 licensed ISPs of which 35-40 were active). Given the proliferation of WiFi, including through the informal resale of services by institutional users, the number of Internet users is likely to be higher. Telkom’s Speedy ADSL broadband service is now available in 15 cities, mainly in and around Jakarta.

in Indonesia is primarily through dial-up, and limited by access to fixed lines. Broadband access (cable, DSL) is extremely limited. An estimated 3 percent of businesses and less than 0.5 percent of households have broadband connections, mainly in Jakarta. The wireless broadband market appears promising. There are currently 20 licensed broadband wireless operators using the 2.5, 3.5, 5 and 10 GHz bands. There is a growing number of unlicensed broadband wireless ISPs using the 2.4 GHz band.³ However, these and many other ISPs are constrained by high costs of connectivity, and inadequate bandwidth (data transmission capacity)

Limited Internet access is attributable to: the paucity of fixed-lines, relatively low diffusion of personal computers (1.5/100 persons), and particularly the very high (monopolistic) price of leased lines and international bandwidth, and the limited reach and insufficient capacity or *bandwidth* of terrestrial backbone infrastructure particularly in Eastern Indonesia. With regard to leased lines, the wholesale price of a 2 Mbps 2km local leased line was US\$4,000 per month in mid-2006, four times the EU benchmark price. International connectivity also cost about four times the EU benchmark price. ISPs report that the cost of connectivity accounts for 60-80 percent of their operating costs, with a cascading effect on retail Internet access prices⁴. With regard to bandwidth, the existing Indonesian “backbone” is limited in extent, consisting of multiple networks owned by the different operators (a combination of microwave, satellite, and limited fibre optic networks). Although operators are beginning to expand into high-speed fibre-optic networks, there is very little backbone outside Java and Sumatra. Eastern Indonesia relies largely on high-cost satellite communications. WiMAX (long-range broadband wireless access/backbone) is still in the trial stage but offers potential: for example, a pre-WiMAX network has been set up in Banda Aceh.

3. Outlook: Rising Demand; New Technologies

Access to telecommunications services, particularly wireless, is projected to improve in the medium-term, boosted by strong demand, particularly for prepaid services. Industry forecasts suggest that wireless teledensity is projected to increase to over 40 percent by 2009, and fixed to 9 percent. Internet access is forecast to increase to 21 percent during this period, with access to broadband still lagging at around 0.5 percent. The question is whether access in Indonesia can improve quickly enough, relative to competitors.

Other trends in the market include:

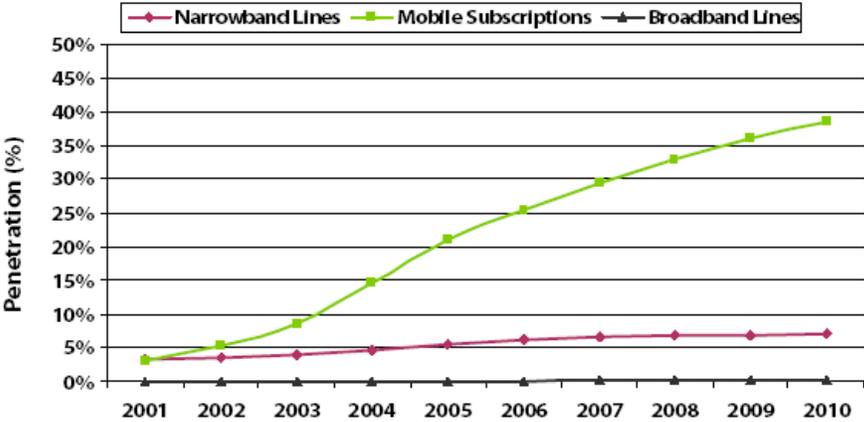
- Increasing demand for mobile voice and data services, including basic text messaging (SMS), multi-media messaging (MMS) and high-speed wireless data (3G);
- Increasing demand for advanced data communications (Internet, multimedia) and particularly for broadband access. While the market for 3G services is still very limited, 3G technology is expected to play an important role in the further development of the telecommunication market given the reduced cost/minute and the additional broadband capabilities.

³ The 2.4 GHz band was opened up for unlicensed use—as is the practice in many countries—in January 2005 and has stimulated increased entrepreneurship in the ISP market

⁴ Goswami, D. & Purbo, O. *WiFi Innovation in Indonesia*, 2006. Discussion Paper.

- Convergence of information and communications technologies. “Next-generation” Internet Protocol (IP) networks (requiring high-speed data transmission capacity or bandwidth) are able to carry a full range of services (voice, data, TV). These technologies affect the overall market structure and level of competition by changing conditions for supply or demand patterns, and blurring the distinction between networks and services.

Figure 2. Telecommunications Infrastructure Outlook.



Source: Pyramid Research (2005).

Current trends thus indicate that, in a pro-competitive policy and regulatory environment, there is strong potential for new investment and diversification of service provision to consumers, and to address inequitable access. The principal challenge is ensuring that the policy and regulatory reforms indeed support a more competitive market, facilitate the diffusion of new technologies, particularly next-generation/Internet-based, and facilitate increased investment as well as public-private partnerships.

4. Policy and Regulatory Developments

Indonesia is heading in the direction of a more competitive market, but it is questionable whether there is as yet sufficiently robust competition in all market segments to help realize this potential. The sector policy and regulatory reform agenda needed to facilitate competition is comprehensive. Moreover, regulatory decisions need to be fully depoliticized and made subject to technical/professional review. **The government has made numerous reform commitments.** Its overall policy objective, as per Law 36/1999 on Telecommunications and the 1999 Sector Blueprint, is to facilitate competition and promote a level playing field. Specific reform commitments include:

- introduction of cost-based interconnection and introduction of a call traffic clearing system (SKTT) ;
- tariff rebalancing;
- readjusting the national numbering plan particularly for domestic long distance, international direct dialing and VoIP;

- early termination of exclusive rights on the domestic and international fixed network (and associated compensation payments to the incumbents);
- introduction of modern telecommunications licenses;
- radio spectrum management reform, including 3G licensing
- implementation of a Universal Service Obligation (USO) program
- updating the 199 Blueprint, and
- reorganization of the Ministry and empowerment of the independent regulator (BRTI).

Progress has been incremental. Principal developments in 2005-6 may be summarized as follows.

(a) Interconnection. Resolving this difficult issue has important implications for revenue-sharing among operators, retail pricing, and market entry, including for VoIP service providers. The existing arrangements and practices have been a major deterrent to facilities-based competition, for example. Following a detailed cost modelling exercise and consultative process, an Interconnection Decree was issued in February 2006, to become effective in January 2007. The timetable for implementation is still in progress in particular as the two major operators, Telkom and Indosat have concluded bilateral interconnection agreements, based on revenue-sharing. However, operators have been instructed to submit reference interconnection offers. The SKTT traffic clearing system was established but is not operational, due to the lack of enabling regulations, and some resistance from operators.

(b) Tariffs. Changes to **call tariffs** have proved politically sensitive, hence implementation has been partial. In January 2002, the government announced a plan to increase fixed line tariffs by an average of 45.49 percent by January 2005; the first 15 percent increase was implemented in 2002. The 2003 increase did not take place due to lack of approval by the legislature. In March 2004 the government announced that it would allow operators to rebalance their tariffs, with the resulting weighted average of tariffs increasing by 9 percent. Since then, local tariffs have increased about 28 percent, while long-distance tariffs have fallen around 10 percent. Wireless operators and customers have resisted increases in local call tariffs as the mobile-fixed interconnection charge is currently about 50 percent of the local call charge. The issue of **wholesale Internet tariffs** and **international bandwidth pricing** was noted above and will require greater regulatory attention.

(c) Numbering. Fixed-wireless licenses have been granted for domestic local service, allowing operators to provide service within specified area codes (without roaming). Calling rates are required to be comparable with fixed rates. The implementation of new access codes (3-digit for domestic long distance, and international direct dialing, and 5-digit for VoIP) has been approved. Implementation is to be phased in over a five-year period.

(d) Licenses. Under the 1999 law, existing licenses for telecommunications services are to be replaced by “modern licenses” including mandatory obligations for license holders (construction, service, network performance, USO contributions). Three license categories were introduced in the 1999 law: for telecom networks, services, and special telecom operations. The transition arrangements for existing licenses are unclear. A related issue is whether or not the existing duopoly arrangement for fixed-line services (Telkom and Indosat) will continue to 2010

as previously envisaged, given the entry of wireless/fixed-wireless competitors, and alternative networks. Compensation payments for early termination of Telkom and Indosat's exclusive rights in their respective sub-sectors (Telkom domestic fixed and Indosat international) have been budgeted and the first installment paid.

(e) Radio Spectrum Management. Spectrum is a scarce and valuable public resource and its management attracted substantial media attention in 2005-6. The government has been revising its radio spectrum management policies in light of new entry (3G mobile), and new technologies (broadband wireless access). The main issues are: (i) the allocation of equal 5MHz spectrum "blocks" to all five 3G operators—the two licensed in 2004, and the three subsequently licensed after the February 2006 auction; (ii) the need to reallocate spectrum previously assigned to CDMA operators⁵ for 3G; and (iii) the proposed licensing and allocation of high-frequency bands for broadband wireless. With regard to other spectrum issues, the government declared that the 2.4 GHz band would be license-exempted (Ministry of Transportation's Ordinance on the use of 2.4 GHz for high-speed Internet). This was an important decision that has allowed WiFi services to expand as noted above.

(f) Universal Service Obligation (USO). The government has taken steps to address inequitable access to telecommunications. The sector ministry's goal is to ensure that all villages have access to basic telephony by 2010. In 2003 the government launched its first Universal Service Obligation (USO) program, based on a turnkey approach, with infrastructure and equipment financed directly from the national budget, and remaining under government ownership. In this first phase, the government contracted selected operators to install physical connections in around 5,600 target villages, overwhelmingly using expensive satellite technology. However, the outcomes fell short of expectations. The program experienced a number of difficulties associated with high equipment installation and maintenance costs, non-accessibility of telephones, and high costs to consumers, resulting in limited utilization. Most significantly, this earlier program did not anticipate the parallel rollout of wireless networks to many of the target areas, which made the use of satellite phones unattractive to consumers.

The USO program is being redesigned. A number of the policy and regulatory elements are in place, in particular Government Regulation No. 28/2005, under which telecommunications operators are required to contribute 0.75 percent of their annual gross revenues (minus provision for bad debts and interconnection charges) into a USO fund. The exact modalities for use of the USO funds are still being developed as a number of very important issues remain unresolved. These include: (a) appropriate governance arrangements and management structures for the USO fund; (b) flow of funds between the Ministry of Finance—which considers these funds to be non-tax revenues, governed by Presidential Decree (PP) No. 54—and the Ministry of Communications and IT; (c) eligibility of expenditures that can be financed under PP No. 54 (under the current legislation, any goods procured under the USO fund would remain government property); and (d) detailed design of the USO program, including outcome/performance indicators. A pilot program is to be developed for selected areas using an output-based approach/least subsidy model of private-public partnership.

⁵ The government required CDMA fixed-wireless operators to migrate from the 1900MHz band so this could be allocated for 3G, at some cost to the operators.

(g) Sector Institutions. The sector ministry has been reorganized. The Ministry of Communications and Information Technology, has oversight powers across the full range of telecommunications and media, effective February 2005. It has primary responsibility for telecommunications sector reform and development—incorporating the directorate-general of post and telecommunications (DG-Postel) in addition to existing responsibilities for ICT applications and broadcasting/information services.⁶ **The sector regulator has become increasingly active, though full regulatory independence has not been achieved.** The Indonesian Telecommunications Regulatory Body (Badan Regulasi Telekomunikasi Indonesia, or BRTI), established in July 2003, became effective on January 4, 2004. BRTI consists of the telecommunications regulatory committee (KRT), and is chaired by the Directorate General of Post and Telecommunications (DGPT). BRTI is ostensibly responsible to issue licenses and resolve disputes and advise government on telecoms policy issues. However, BRTI's responsibilities vis-à-vis DGPT are not clearly-defined. BRTI is not fully independent of DGPT, and the 1999 Telecommunications Law is unclear about its degree of independence. Since DGPT became part of MCIT in June 2005, BRTI effectively operates under the ministry's umbrella. BRTI's decisions are issued in the form of DGPT decrees. It is chaired by the Director-General, Postel. A further constraint to BRTI's effectiveness is its limited staff and resources which constrains its ability to operate independently.

In sum, while there has been some progress in the reform agenda, a number of regulatory issues remain unresolved. The cumulative effect of this lack of clarity and slow implementation is a regulatory drag on investment and service diversification. Moreover, on top of this unfinished agenda, **a second wave of policy/regulatory issues looms ahead in view of the market trends and technological changes** described above. Major challenges in the short to medium term include:

- **Supporting more widespread Internet access:** more effective regulation of leased-line and international gateway access; review of the licensing regime for ISPs that prevents them from building their own infrastructure (a prohibition that WiFi service providers are currently circumventing);
- **Adjusting to convergence** of telecommunications/broadcasting: for example, ensuring that regulations do not hinder “triple-play” of voice, video and data services;
- **Supporting new technologies** that lead to the development of packaged-value-added services;
- **Facilitating a more dynamic and competitive wireless market:** licensing of mobile virtual network operators (MVNOs); mobile number portability, for example.

⁶ MCIT now consists of three Directorate Generals (DGs): Directorate General of Posts and Telecommunications (formerly in the Ministry of Communications, and officially absorbed into MCIT in June 2005), Directorate General of Information Technology (IT) Applications, and Directorate General of Broadcasting and Information Dissemination, reflecting the converging nature of the sector. Other government institutions involved in telecommunications sector development include: (a) the Coordinating Ministry for Economic Affairs which chairs the telecommunications sector restructuring team (Tim Koordinasi Telematika Indonesia, appointed by presidential decree 9/2003 and covering infrastructure, applications, legal structures, human resources, finance and investment, standardization and e-government); (b) Bappenas, is interested in overall sector structure and competition policy and has commissioned a study on the structure of the telecoms market, post-duopoly; (c) the State Ministry of State Enterprises (holds government shares in Telkom and Indosat); (e) the Ministry of Finance is interested in sector financing, revenue-generation, as well as government ICT applications that could benefit from greater diffusion of communications infrastructure

5. Investment Needs and Opportunities

The main investment needs in telecommunications infrastructure are those that will contribute to **more affordable, equitable access**. These are: (a) development of **nationwide backbone capacity**, and (b) **“last mile” rural access** to the village. Both types of investments offer significant enabling benefits to other sectors and activities, and potential for value-added services. They are opportunities for different types of private-public partnership (PPP) transactions.

(a) Backbone. As noted above, Indonesia does not have adequate capacity on its backbone network. The domestic telecommunications backbone comprises proprietary networks (a combination of microwave, satellite, and fibre-optic networks) operated by Telkom, Indosat, Exelcomindo/XL and Comnet. There is very little backbone outside Java and Sumatra; Telkom is currently constructing the *Jasuka Backbone Ring* to connect Java, Sumatra and Kalimantan in 2006. Eastern Indonesia relies largely on high-cost satellite communications. The required steps to accelerate broadband access in Indonesia include:

- investing in broadband access at existing submarine cable landing stations. There are optical submarine cables linking Jakarta, Surabaya and Medan to the rest of the world so it should be possible to realize affordable high capacity access
- developing fibre-optic connectivity between all islands and main cities to the main landing stations. Currently many places are only connected by low capacity microwave links or even only by expensive satellite links.
- Local Broadband Access solutions such as (A)DSL in areas with copper wire fixed lines and Fixed Wireless Broadband (e.g. WiMAX) elsewhere.

The notion of a nationwide high-speed (fibre-optic) backbone network has been under consideration for some time. The government has established a technical working group led by the Ministry of Communications and Information Technology, and has completed a preliminary technical design for the project known as the “Palapa O2 Ring.” It intends to undertake an in-depth feasibility study in 2007 to: (i) review alternative technical configurations, including links to international fibre-optic cables and options for sharing of existing proprietary network infrastructure; (ii) develop a robust business case for the backbone network, (iii) assess its economic, and financial viability, (iv) identify financing options and institutional and governance structures for implementation, operation, and maintenance, ensuring that the public sector contribution to the project is minimized and narrowly-targeted; and (v) conduct a detailed market/demand analysis, identifying potential demand aggregation or “anchor tenants” for the network to facilitate cost recovery.

The development of a nationwide communications backbone network in Indonesia would contribute to a reduction in the overall cost of voice and data communications services in Indonesia, resulting in significantly more affordable access. It would increase in the geographical area in which the provision of communications services is commercially viable. It would also stimulate competition in the communications sector through a reduction in the investment costs for new entrants.

(b) Rural Access. Investment in village-level communications would entail a different type of PPP approach that focuses on the least commercially attractive, or marginal segment of the market. The PPP approach that the government is considering is output-based least subsidy using a reverse auction process. The subsidy payments would come from the USO fund once it becomes operational (the pilot program outlined above will be used to design the specific mechanisms). Using such a mechanism the government would award subsidies competitively to the lowest bidder at the national level for provision of network infrastructure in areas currently without network coverage; and, in areas that do have network coverage but limited consumer access, it would award subsidies for provision of public telecommunications access, such as “village phones” of a given quality and cost over a fixed period.

6. Conclusion

Despite encouraging progress in increased wireless telecommunications coverage and good prospects in this area, Indonesia is lagging behind many of its neighbours in terms of access, particularly in rural and remote areas. There are significant investment opportunities through public-private partnerships both in backbone/broadband infrastructure, and, through different business models, “last mile” village access.

Telecommunications, like other types of infrastructure development, is a means to an end. In that regard, investing in Indonesia’s communications infrastructure is likely to have wide-ranging social and economic impacts, for example through:

- Significant, measurable reductions in transaction costs for government, businesses and consumers
- Increased efficiency of communications within a highly decentralized government structure, contributing to improvements in services delivery.
- Significantly increased utilization of information and communications technology (ICT) applications in Indonesia in a variety of sectors. These include, for example, government information systems/e-government services, mobile financial services, education and health information and services, producer price information.
- Improved access to markets and market information, local trade facilitation, and promotion of direct communication along the supply chain, and
- Potentially greater social cohesion in a highly diverse, archipelagic nation.

Annex 1. Indonesia Telecommunications Snapshot, 2005

| Market Segment | Main Players |
|---|---|
| Fixed Line (copper) | <p>Total lines: about 9.1 million.</p> <p>PT Telkom</p> <p>PT Indosat</p> <p>PT BatamBintan</p> <p>[Long distance and International Duopoly: PT Telkom and PT Indosat; some competition from VoIP]</p> |
| Fixed Wireless (CDMA 2000-1x. Limited to within one fixed-line area code; no roaming) | <p>Total subscribers: around 4.5 million</p> <p>PT Telkom (98% market share): through Telekom Flexi CDMA-2000 1X)</p> <p>PT Indosat. StarOne (fixed wireless in Surabaya, Malang, Pasuran, Bogor)</p> <p>PT Bakrie. eSia fixed-wireless in 15 towns in Jakarta and W. Java</p> <p>PT BatamBintan Telekomunikasi. Fixed wireless, licensed to operate in Yogyakarta.</p> |
| Mobile (GSM, CDMA 450, CDMA2000-1x, WCDMA) | <p>Total subscribers: Over 48 million</p> <p>Three GSM operators with total of 98% market share; also offering GPRS, EDGE data services:</p> <p>PT Telkomsel (Telkom Subsidiary). Coverage in all 440 <i>kabupaten</i> and 40% of <i>kecamatan</i>. About 26 million subscribers.</p> <p>PT Indosat. Coverage 383 <i>kabupaten</i>. 13 million subscribers</p> <p>PT Exelcomindo (XL) Coverage in Sumatra, Java, Bali, NTB, Kalimantan and Sulawesi. 8.2 million subscribers.</p> <p>Other: CDMA : Bimantara Citra (Mobile-8); Mandara, Mobisel, Primasel</p> |
| 3 rd - Generation mobile (3G) | <p>Licensees: Hutchinson CP Telecommunications; PT Natrindo Telepon Selular (Lippo Telecom), Telkom, Indosat, Excelcomindo (XL).</p> |
| Internet and Data | <p>About 20 million users, 9 percent penetration rate.</p> <p>150 licensed Internet Services Providers; about 35-40 operating.</p> <p>Seven licensed VoIP Operators: Telkom, Indosat, XL, Atlasat, Gaharu, Swaguna Widya Pratama, + unlicensed operators/services</p> <p>20 licensed broadband wireless operators using 2.5G ,3.3G, 3.5 G , 5.6G, 5.7G, 10.5G, 10.5G bands.</p> <p>Broadband; Telkom (ADSL) provider through <i>Speedy</i> service; mostly in Jakarta, Bogor and Selang; Kabelvision (cable) in Jakarta, Surabaya and Bali.</p> |

