Economic Aspects of Spectrum Management: An Indonesia Case Study

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Agenda

1. COUNTRY PROFILE : INDONESIA
2. BRTI & NATIONAL SPECTRUM MANAGEMENT
3. SUMMARY OF ICT MARKET IN INDONESIA
4. SPECTRUM MANAGEMENT CASE STUDY
5. LESSON LEARNED AND CHALLENGES
COUNTRY PROFILE : INDONESIA

The world’s largest archipelago
- More than 17,500 islands
- Spanning the length of 3,977 miles
- Total area 1.9 million square miles

Scattered rural areas

Difficult landscape

Population*: 248.8 million

34 provinces*
511 districts/city*
80,714 villages*

*2013
source: Indonesia Statistics Agency, 2014
THE ARCHIPELAGO ECONOMY: UNLEASHING INDONESIA’S POTENTIAL

*Indonesia today...*

- 16th-largest economy in the world
- 45 million members of the consuming class
- 53% of the population in cities producing 74% of GDP
- 55 million skilled workers in the Indonesian economy
- $0.5 trillion market opportunity in consumer services, agriculture and fisheries, resources, and education

*...and in 2030*

- 7th-largest economy in the world
- 135 million members of the consuming class
- 71% of the population in cities producing 86% of GDP
- 113 million skilled workers needed
- $1.8 trillion market opportunity in consumer services, agriculture and fisheries, resources, and education

Source: McKinsey Global Institute, September 2012
FO backbone covers more than 72% of districts. Our National FO systems (PALAPA RING) will be ready for service in 2018.
2G, 3G and 4G BTS cover all provinces providing more than 90% coverage of cellular.
SOCIO-ECONOMIC OF BROADBAND

Exhibit 6: Growth impact of telecommunications
(GDP percentage point increase due to 10 percentage-point increase in penetration)

Source: World Bank 2010
**INDONESIA BROADBAND PLAN TARGETS**

**2013**
- **Fixed Broadband:** 15% HH (1Mbps) and 5% population;
- **Mobile Broadband:** 12% population (512 kbps)

**2019**
- **Urban:**
  - Fixed Broadband: 71% HH (20Mbps);
  - Mobile Broadband: 100% pop (1 Mbps)
- **Rural:**
  - Fixed Broadband: 49% HH (10Mbps);
  - Mobile Broadband: 52% pop (1 Mbps)

**Utilization:**
- Broadband service price: max 5% of average monthly income
- Priority Sectors: e-Government; e-Education; e-Health; e-Logistic, e-Procurement
<table>
<thead>
<tr>
<th>OPERATOR</th>
<th>SUBSCRIBER</th>
<th>RADIO ACCESS NETWORK</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELKOMSEL</td>
<td>118.140.245</td>
<td>850/900/1800/2100 (52.5 MHz)</td>
<td>2G/3G/4G</td>
</tr>
<tr>
<td>Indosat Ooredoo</td>
<td>50.846.707</td>
<td>850/900/1800/2100 MHz (40 MHz)</td>
<td>2G/3G/4G</td>
</tr>
<tr>
<td>XL Axiata</td>
<td>45.000.000</td>
<td>900/1800/2100 MHz (45 MHz)</td>
<td>2G/3G/4G</td>
</tr>
<tr>
<td>3 (Three)</td>
<td>25.102.343</td>
<td>1800/2100 MHz (20 MHz)</td>
<td>2G/3G/4G</td>
</tr>
<tr>
<td>Smartfren</td>
<td>2.438.843</td>
<td>850/2300 MHz (30 MHz)</td>
<td>2G/3G/4G</td>
</tr>
<tr>
<td>Ceria</td>
<td>52.402</td>
<td>450 MHz (7.5 MHz)</td>
<td>2G/4G</td>
</tr>
</tbody>
</table>
IMT SPECTRUM USED IN INDONESIA (195 MHZ)

Indonesia’s current spectrum allocations for GSM players

Source: Company data, Macquarie Research, October 2016

AVAILABLE FOR 2016 AUCTION: 2x10 MHZ (FDD 2100) + 1x30 MHz (TDD 2300)
INDONESIA CELLULAR MARKET
will grow to IDR 140 Trillion by 2020, fuelled by data revenue growth
INDONESIA CELLULAR MARKET

The Scissor Effect

Source: Nokia-Siemens; IBM Institute for Business Value (IBV) Analysis
SPECTRUM MANAGEMENT FOR MOBILE BROADBAND ACCELERATION
OUR REGULATORY MAIN STAKEHOLDER

GOVERNMENT
1. TELECOMUNICATION PENETRATION
2. CYBER SOVEREIGNTY
3. ECONOMIC GROWTH
4. NATIONAL COMPETITIVE ADVANTAGE

INDONESIA TELECOM REGULATORY AUTHORITY

INDUSTRY
1. HEALTHY COMPETITION
2. CLEAR & FAIR REGULATION
3. BUSINESS SUSTAINABILITY

PEOPLE
1. CUSTOMER PROTECTION
2. CUSTOMER PRIVACY
3. DATA PROTECTION & DATA PRIVACY
SPECTRUM PRICING

Fig 5  Price of 2100MHz auctions across ASEAN

Fig 6  Price of other spectrum auctions across ASEAN

Fig 7  Previous 2100MHz spectrum auctions around ASEAN

<table>
<thead>
<tr>
<th>Country</th>
<th>Total allocation (MHz)</th>
<th>Year</th>
<th>Total price (US$mn)</th>
<th>Price/5MHz (US$ mn)</th>
<th>Population</th>
<th>US$ / pop / MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>15</td>
<td>2001</td>
<td>57.8</td>
<td>19.3</td>
<td>4,138,000</td>
<td>0.93</td>
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<tr>
<td>Malaysia</td>
<td>15</td>
<td>2003</td>
<td>39.5</td>
<td>13.2</td>
<td>24,890,000</td>
<td>0.11</td>
</tr>
<tr>
<td>Indonesia</td>
<td>15</td>
<td>2006</td>
<td>113.2</td>
<td>37.7</td>
<td>228,000,000</td>
<td>0.03</td>
</tr>
<tr>
<td>Malaysia</td>
<td>5</td>
<td>2006</td>
<td>14.6</td>
<td>14.6</td>
<td>26,330,000</td>
<td>0.11</td>
</tr>
<tr>
<td>Singapore</td>
<td>5</td>
<td>2010</td>
<td>14.3</td>
<td>14.3</td>
<td>5,077,000</td>
<td>0.56</td>
</tr>
<tr>
<td>Thailand</td>
<td>45</td>
<td>2012</td>
<td>1,342.9</td>
<td>149.2</td>
<td>66,790,000</td>
<td>0.45</td>
</tr>
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</table>

Currency exchange based on time of auction
Source: Company data, Macquarie Research, October 2016
SPECTRUM PRICING

Fig 2  Est. spectrum price based on 2100MHz auction comps across ASEAN

<table>
<thead>
<tr>
<th>Country</th>
<th>Price (US$mn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>141</td>
</tr>
<tr>
<td>Singapore</td>
<td>971</td>
</tr>
<tr>
<td>Thailand</td>
<td>581</td>
</tr>
<tr>
<td>Indonesia</td>
<td>43</td>
</tr>
</tbody>
</table>

ARPU across ASEAN as of mid-2016

<table>
<thead>
<tr>
<th>Country</th>
<th>ARPU (US$/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>2.7</td>
</tr>
<tr>
<td>Malaysia</td>
<td>21.5</td>
</tr>
<tr>
<td>Philippines</td>
<td>2.5</td>
</tr>
<tr>
<td>Singapore</td>
<td>34.8</td>
</tr>
<tr>
<td>Thailand</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Source: Company data, Macquarie Research, October 2016
MANAGING SPECTRUM OF 450 MHZ

Channel Arrangement
MANAGING SPECTRUM OF 800 MHZ + E-GSM
CASE STUDY : RE-FARMING & RE-PURPOSING
MANAGING SPECTRUM OF 900 MHZ
CASE STUDY: NEUTRAL TECHNOLOGY

Technology Evolution Path (All Operator are already contiguous):
GSM/EDGE → UMTS → HSPA → HSPA+ → LTE

All Operator ready to implement UMTS / 3G 900
MANAGING SPECTRUM OF 1800 MHZ
CASE STUDY: RE-FARMING

[Diagram showing spectrum allocation and refarming]
MANAGING SPECTRUM OF 2100 MHZ

CASE STUDY: RE-FARMING

Sebelum Penataan Menyeluruh


1920MHz (UL) 2110MHz (DL) (UL) 1980MHz (DL) 2170MHz

Setelah Penataan Menyeluruh


1920MHz (UL) 2110MHz (DL) (UL) 1980MHz (DL) 2170MHz
MANAGING SPECTRUM 2300 MHZ
CASE STUDY: CONSOLIDATION

Spectrum auction at December 2016 (30 MHz)
Allocate to Smartfren (30 MH) as compensation for migration from PCS1900 & swap for CDMA 850 MHz
- Regional BWA endorse for the consolidation of mobile national coverage (30 MHz)
OUR NEXT CHALLENGE TO FULFILL SPECTRUM SCARCITY
RE-PURPOSING 2,6 GHZ?
DIGITAL DIVIDEN 700 MHZ (2018-2019)

There is 112 MHz (694 – 806 MHz) Digital Dividend available, or 2 x 45 MHz FDD can use to accelerate mobile broadband in nation.
SPECTRUM SHARING POLICY

- Areas with high business potential
- Heavy competition between CSPs
- Service and performance differentiation needed
- Full control of own network assets
- Base method for network consolidation

- Areas with moderate business potential
- Competition between CSPs
- Partial control of network assets

- Areas with low business potential
- Possibly regulatory coverage requirements

Active RAN Sharing

Passive RAN / Site Based Sharing

Roaming Based Sharing
LTE RAN SHARING
WITH MOCN SPECTRUM SHARING

**City #1**

**MNO A**

**Home**

![Diagram of LTE RAN sharing](image1)

**City #2**

**MNO B**

**Home**

![Diagram of LTE RAN sharing](image2)
The Way Forward:
Hybrid Model for Indonesia Case

**URBAN:**
- High Populated Area
- PASSIVE SHARING - MNO build their own network to get more CAPACITY

**SUB-URBAN / RURAL:**
- Less Populated Area
- ACTIVE SHARING – 4G/3G MOCN & 2G RAN Sharing for MORE EFFICIENT Network Roll-out and better COVERAGE
The Way Forward:
Trend of Regulation Flexibility

1. Technology Flexibility: Neutral Technology
2. Infrastructure Flexibility: Network Sharing
3. Coverage Area Flexibility: National Roaming
4. Spectrum Flexibility: Spectrum Sharing/Trading
5. Operations Flexibility: MVNO, Managed Services?
LESSON LEARNED & RECOMMENDATION

1. Spectrum scarcity is here, Netral technology – Netral services?

2. Spectrum flexibility is inevitable

3. Collaborative regulation (5.0) is needed

4. Key success factor: Multistakeholder approach
Twenty years from now you will be more disappointed by the things you didn't do than by the ones you did do. So sail away from the safe harbour. Catch the trade winds in your sails. Explore. Dream. Discover.

- Mark Twain