Spectrum Policies for Greater Spectrum Utilization

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A General View of the Telecommunications Sector in Brazil

Mobile Service, Market Share

- **TELEFÔNICA** (VIVO)
- **TIM**
- **CLARO**
- **OI**

<table>
<thead>
<tr>
<th>Month</th>
<th>TELEFÔNICA</th>
<th>TIM</th>
<th>CLARO</th>
<th>OI</th>
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</thead>
<tbody>
<tr>
<td>Aug-16</td>
<td>30.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sep-16</td>
<td>29.50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct-16</td>
<td>29.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov-16</td>
<td>28.50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec-16</td>
<td>28.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-17</td>
<td>27.50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb-17</td>
<td>27.00%</td>
<td></td>
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</tr>
</tbody>
</table>

2G: 100% Municipalities
3G: 90% Municipalities; 98% Population

Mobile Service, Technology Share

- **GSM**: 19%
- **WCDMA**: 46%
- **LTE**: 28%
- **Other**: 7%

- **GSM**: 7%
- **WCDMA**: 46%
- **LTE**: 28%
- **Other**: 7%

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<th>Share</th>
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<td>19%</td>
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</tr>
<tr>
<td>Other</td>
<td>7%</td>
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</tbody>
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4G: 35% Municipalities; 77% Population
Optical fiber backhaul: 58% Municipalities
A General View of the Telecommunications Sector in Brazil

11 / 14 / 15 Rights to explore Brazilian Satellite

- To be launched
- Recently launched
- Operating

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Spectrum Scarcity → a technical problem with economic implications!

Different types or dimensions of efficiency:
- Allocative, Productive, Distributive, Dynamic Efficiencies;
- Technical efficiency;
- Social efficiency;
- Efficiency of scale.

Competitive markets → less regulation;
- Not so competitive market → regulate;
- Not competitive market → facilitate and encourage small and medium Operators.

Broaden Internet Access.
Critical Elements of the Transition to DTV

• Accomplishment of the ASO schedule
• Campaign to promote the transition to DTV
• Distribution of set-top box, cable and antenna kits
• Perform the re-arrangement of 52-69 TV channels
• Activation of 4G LTE in the 700 MHz band and mitigation of possible harmful interference
## Analog Switch-Off Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Region(*)</th>
<th>Cities Affected</th>
<th>Population Affected (Thousands People)</th>
<th>Low Income Families (Thousands Families)</th>
</tr>
</thead>
<tbody>
<tr>
<td>29/11/2015</td>
<td>Rio Verde/GO (Pilot)</td>
<td>1</td>
<td>202</td>
<td>25</td>
</tr>
<tr>
<td>26/10/2016</td>
<td>Brasília - DF</td>
<td>10</td>
<td>3,862</td>
<td>369</td>
</tr>
<tr>
<td>29/03/2017</td>
<td>São Paulo - SP</td>
<td>39</td>
<td>20,981</td>
<td>1,676</td>
</tr>
<tr>
<td>31/05/2017</td>
<td>Goiânia - GO</td>
<td>29</td>
<td>2,849</td>
<td>277</td>
</tr>
<tr>
<td>26/07/2017</td>
<td>BA, MG, CE, PE</td>
<td>97</td>
<td>18,107</td>
<td>2,282</td>
</tr>
<tr>
<td>27/09/2017</td>
<td>SP Interior</td>
<td>158</td>
<td>13,926</td>
<td>929</td>
</tr>
<tr>
<td>25/10/2017</td>
<td>RJ, ES</td>
<td>26</td>
<td>14,250</td>
<td>1,289</td>
</tr>
<tr>
<td>31/01/2018</td>
<td>PR, SC, RS</td>
<td>121</td>
<td>10,425</td>
<td>793</td>
</tr>
<tr>
<td>30/05/2018</td>
<td>PA, PB, AL, AM, PI, SE, RN</td>
<td>152</td>
<td>14,158</td>
<td>1,934</td>
</tr>
<tr>
<td>28/11/2018</td>
<td>RR, MS, MT, AP, TO, RO, AC, others</td>
<td>613</td>
<td>19,540</td>
<td>2,156</td>
</tr>
<tr>
<td>05/12/2018</td>
<td>Other minor regions</td>
<td>80</td>
<td>8,041</td>
<td>1,019</td>
</tr>
</tbody>
</table>
• 58 regulatory projects to be initiated or approved by the end of 2018
• 20 of them related to Spectrum Management, including:
  – Short Range Devices Regulation (unlicensed use)
    • New frequency bands with differentiated emissions limits: ex. 57-64 GHz
    • Approval: in next months
  – AM → FM migration will release channels 2, 3 and 4
  – Evaluation of the need to review, update and unify the technical regulations of
    the broadcasting services (AM, FM and TV), within the premises of consistency
  – Regulation for dynamically access the spectrum in the VHF and UHF bands.
How to improve spectrum utilization and protect incumbent services?

- Spectrum sharing is a way forward to improve technical and economic efficiencies;
- Model real-world systems in sharing and compatibility studies;
- Not overprotect incumbent services;
- Use best practices Regulation;
- Dynamic spectrum access can bring benefits to users, economy and society, once it permits to serve more users in the same spectrum range, protecting incumbent services.
Thank you!

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